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Air Sampling and Monitoring Data Report

Lockheed Martin Site
The Dalles, Oregon

October 26, 2012

ARCADIS

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Air Sampling and Monitoring Data Report

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Executive Summary

On September 6, 2012, the U.S. Environmental Protection Agency (EPA) issued a Unilateral Administrative Order (UAO) to the Lockheed Martin Corporation (Lockheed Martin) to address actual or threatened releases of toxic, asphyxiating, and explosive gases at the Lockheed Martin Site in The Dalles, Oregon (the "Site"). A field program was conducted from September 13 through 21, 2012 under an EPA approved Sampling and Analysis Plan that was incorporated into the UAO. The objective of this sampling program was to collect field data for the following purposes:

- Assess the potential for exposure of Site workers, off-Site workers, and nearby residents to toxic and/or asphyxiating gases at the RCRA and CERCLA Landfills and all leachate collection systems (LCSs) at the Site;

- Assess the potential for auto-ignition and/or fire from explosive gases at the RCRA and CERCLA Landfills, and all leachate collection systems at the Site; and

- Assess the chemistry of various *in situ* treatment methods that have been employed at the RCRA and CERCLA Landfills and all LCSs at the Site.

The sampling program used field instrumentation and extractive sampling with laboratory analysis to quantify gases including acetylene, ammonia, carbon dioxide, hydrogen fluoride, hydrogen, hydrogen cyanide, hydrogen sulfide, methane, nitrogen, oxygen, and phosphine. Sampling was conducted around the perimeter of the two landfills and LCS areas outside of fences to assess the presence and concentration of the chemicals of concern (COCs) that could impact off-Site workers. Sampling was conducted on the Site at potential exposure areas, including near the RCRA Landfill vents, buildings, the RCRA sump, manholes and other facilities where on-Site workers could potentially be exposed to COCs. Source areas, including vents on the RCRA Landfill, the RCRA Sump and within manholes were characterized. Ambient air conditions at a total of 87 locations at the RCRA Landfill and 141 locations at the CERCLA Landfill were assessed in real time using field monitoring equipment. Extractive air samples analyzed at a laboratory included 10 locations at the RCRA Landfill and 14 at the CERCLA Landfill. Wind direction was monitored to allow selection of appropriate up-wind and down-wind sampling locations. Barometric pressure was also monitored to verify sampling was conducted during times of falling barometric pressure to represent times when landfill gas release would be most probable. Sample results at potential exposure points were compared to long-term

exposure screening levels for industrial and commercial workers. Short term exposure screening levels were used for comparison against the on-Site potential exposure point sample results collected from within one foot of a source area.

Results from the fence line sampling around the RCRA Landfill showed a single detection with field instrumentation of ammonia at 1 part per million by volume (ppmv) at the upwind sample location. Laboratory sample results were below screening levels for all RCRA Landfill fence line samples. Near source sample results indicated that only ammonia exceeded the short term screening level near Vent 2, where a concentration of 1.76 milligrams per cubic meter (mg/m^3) was found. Source sampling was done at the vents and the sump at the RCRA Landfill, where laboratory results showed the presence of ammonia, hydrogen fluoride, hydrogen, hydrogen cyanide, acetylene and methane. Carbon dioxide was elevated above atmospheric concentrations and oxygen was lower than atmospheric concentrations. Field instrument readings were taken on composite samples from Vent 2 that showed similar results, and in addition detected hydrogen sulfide and phosphine. The landfill gas discharge rate was measured at Vent 2 during both variable and falling barometric pressure regimes and was estimated at a very low rate of about 4 milliliters per hour (ml/hour).

Laboratory results for fence line samples at the CERCLA Landfill did not exceed any screening criteria; however, a field measurement of ammonia showed a concentration of 1 ppmv, which exceeds the screening criteria. Screening criteria at potential exposure points inside the CERCLA Landfill fence were not exceeded for any of the monitored parameters. Source location laboratory samples at the CERCLA Landfill LCS detected hydrogen fluoride and hydrogen sulfide. Carbon dioxide, methane and oxygen deviated from their normal atmospheric concentrations. A sample within the molasses storage tank indicated the presence of hydrogen sulfide.

Past operations at the landfills included pilot testing of carbon dioxide injections into the RCRA Landfill during 2004 and 2005 that was discontinued since it did not appear to be successful in reducing free cyanide concentrations in the leachate. A vacuum blower operated on a RCRA Landfill vent during dry times of the year from 2005 until early 2011 to induce air into the landfill. At the CERCLA Landfill, biological treatment by land application occurred between 2002 and 2007. Biological treatment within the LCS has been conducted since 2005 and is ongoing. No definitive conclusions regarding effects of the pilot carbon dioxide injections at the RCRA landfill or land application at the CERCLA landfill could be drawn from the data that were collected during this sampling program. Hydrogen cyanide was not detected within the CERCLA LCS,

suggesting that volatilization of hydrogen cyanide from the LCS is not a significant release mechanism.

The hazard analysis indicates that the only parameter that exceeded the screening criteria is ammonia near the CERCLA Landfill tank fence and the RCRA Landfill fence, though the RCRA Landfill fence sample was taken on the upwind side, so it may have not have originated from the landfill. The sampling event does not account for potential long-term temporal variability in landfill gas concentrations, so some uncertainty on the hazard analysis exists. Several other limitations were also encountered, including loss of some samples due to exceeding laboratory holding times for hydrogen sulfide. Alternate analysis results with slightly higher detection limits were available for these samples. The laboratory was unable to obtain detection limits as low as the screening values for hydrogen sulfide. The analytical methods for phosphine are unable to obtain detection limits at the screening level, even under ideal conditions. There were a number of issues with documentation of chain of custody; however, these do not impact the usability of the data.

1. Introduction

On September 6, 2012, the U.S. Environmental Protection Agency (EPA) issued a Unilateral Administrative Order (UAO) to Lockheed Martin to address actual or threatened releases of toxic, asphyxiating, and explosive gases at the Lockheed Martin Corporation Site in The Dalles, Oregon (the "Site"). The UAO was issued pursuant to Section 106(a) of CERCLA, 42 U.S.C. §9606(a). In response to the UAO, ARCADIS U.S., Inc. (ARCADIS) conducted a field monitoring and sampling event from September 13 through 21, 2012 at the Site on behalf of Lockheed Martin. Work performed in response to the UAO included:

- Sampling and monitoring to assess the potential for exposure of Site workers, off-Site workers, and nearby residents to toxic and/or asphyxiating gases at the RCRA and CERCLA Landfills and all leachate collection systems (LCSs) at the Site;
- Assessing the potential for auto-ignition and/or fire from explosive gases at the RCRA and CERCLA Landfills, and all leachate collection systems at the Site; and
- Assessing the chemistry of various *in-situ* treatment methods that have been employed at the RCRA and CERCLA Landfills and all LCSs at the Site.

Note that while Sections IX.31(a) and (b) of the UAO require assessment of the scrubber sludge ponds, the Sampling and Analysis Plan[1] (SAP) attached to the UAO did not specify gas sampling at the Scrubber Sludge Ponds. During a September 11, 2012 meeting, EPA agreed that sampling at the Scrubber Sludge Pond is not required at this time.

This report presents the results of sampling and monitoring used to address these objectives herein.

1.1 Background

The Site is a former primary aluminum reduction plant. While under prior ownership, the Site was part of the Martin Marietta Reduction Facility (MMRF) that the EPA placed

[1] ARCADIS. 2012. Work Plan – Sampling and Analysis Plan Lockheed Martin Site, The Dalles, Oregon. August.

on the National Priorities List (NPL) in 1986. A Record of Decision (ROD) was completed for the Site in 1988. Remedial activities were complete in the early 1990s, and the EPA delisted Site from the NPL in July 1996.

On July 7, 2012, ARCADIS conducted preliminary air quality screening of several components of the RCRA and CERCLA Landfills at the direction of ODEQ. The results of the air quality screening were reported to ODEQ and the EPA on July 20, 2012. On July 20, 2012, EPA required work plans for performing additional landfill gas sampling. The following documents were submitted in response:

- Sampling and Analysis Plan (SAP)
- Revised Site Health and Safety Plan (HASP)
- Quality Assurance Project Plan (QAPP) containing quality assurance/quality control, data validation, and chain-of-custody (COC) procedures in accordance with appropriate EPA guidance

The SAP, HASP, and QAPP were later incorporated into the UAO by EPA.

1.2 Physical Characteristics and Land Use

The Site consists of the Lockheed Martin owned property (Figure 1), which encompasses the CERCLA Landfill, former Scrubber Sludge Ponds, RCRA Landfill, and the CERCLA tank area. The CERCLA Landfill, former Scrubber Sludge Ponds, RCRA Landfill and CERCLA tank area are fenced with locked gates and signage.

The LCS at the CERCLA Landfill collects and treats leachate and shallow groundwater, which is then pumped to the CERCLA tank for final treatment as needed and discharge through an approved Clean Water Act National Pollutant Discharge Elimination System (NPDES) permit discharge outfall to the Columbia River. The CERCLA tank has a capacity of approximately 300,000 gallons.

The RCRA Landfill is located south of the demolished Northwest Aluminum (NWA) facility. The RCRA LCS drains to a sump in the RCRA utility building. The RCRA leachate is periodically transferred to the CERCLA tank for treatment and discharge through the NPDES permit discharge outfall to the Columbia River.

The land in the vicinity of the RCRA and CERCLA Landfills has been annexed as part of the City of The Dalles and is zoned for commercial and industrial use.[2] The aluminum reduction smelter and most of the accompanying buildings and structures have been demolished and removed.

To date, the NWA properties on the west side of River Road (Figure 1) remain largely undeveloped. The reduction process facilities have been demolished, but the alloy plant is still operating under the name Northwest Aluminum Specialties. Northwest Aluminum Specialties and Tenneson Engineering maintain their operations in buildings that were part of the NWA facility and remained after other demolition activities were completed. Public utilities, power, and water are provided by the public utility district and the City of The Dalles. The area between the landfills and the Union Pacific railroad tracks to the west are predominantly open lands. The Port of The Dalles commercial area is to the east across River Road, and the former NWA golf course and Fort Dalles rodeo grounds are to the southwest. The closest residential areas are across the railroad tracks approximately 1,300 to 1,700 feet to the west of the landfills. The nearest surface water bodies are the Columbia River, approximately 1,500 feet to the east, and Chenoweth Creek, approximately 900 feet to the north. The Site is not located within a 100-year floodplain.

2. Field Monitoring and Sampling Activities

This section of the report describes the air sampling and monitoring activities conducted at the Site. The sampling activities reflected the objectives developed in the SAP:

- The first objective (the potential for exposure of Site workers, off-Site workers, or residents to toxic and/or asphyxiating gases) was met by sampling and analyzing ambient air for select gases at potential exposure points, including the landfill fence lines and locations within the landfills. Evaluation criteria for these sample results are specified in Table 1.

- The second objective (the potential for auto-ignition and/or fire from explosive gases) was met by sampling and analyzing both ambient air and landfill gas for target explosive gases at various points around the landfills and within source

[2] City of The Dalles. 2011. Comprehensive Land Use Plan. The Dalles, Oregon.

areas (e.g. CERCLA manholes, RCRA sump and landfill vents). Evaluation criteria for these samples are specified in Table 1.

- The third objective (the chemistry of various *in-situ* treatment methods that have been employed at the RCRA and CERCLA Landfills and LCSs was addressed by measuring the concentrations of gases, including hydrogen cyanide, from the landfills and landfill gas flow rates at the RCRA Landfill.

The seven-step data quality objective process detailed in the SAP was used to clarify the study objectives, define data needs, and specify acceptable levels of decision errors. The analytes required by EPA to be monitored by field and/or laboratory methods are: acetylene, ammonia, carbon dioxide, hydrogen fluoride, hydrogen, hydrogen cyanide, hydrogen sulfide, methane, nitrogen, oxygen, and phosphine. The intent was to at a minimum screen for these parameters at each sampling location (i.e., perimeter/fence line, Site worker exposure areas, and source areas) and then to collect extractive samples at locations specified in the SAP for laboratory measurements of the gases.

Weather conditions were noted at the time of monitoring, particularly barometric pressure and trend, wind direction, and wind speed. In accordance with the SAP, monitoring and sampling were initiated during periods of falling barometric pressure. A temporary meteorological station, including a barometric pressure function with a data logger, was set up on Site to provide real time weather data.

Field notes, logbooks, datasheets, calibration sheets, and sample location photographs are provided in Appendix A.

2.1 Flow Rate Determination Method

On September 15th gas flow was measured using a bubble flow meter attached to the terminus of a stainless steel sampling manifold attached to the vent pipes at the RCRA Landfill. Flow rate measurements using the bubble flow meter were attempted at all three vents and no detectable flows in or out of the vents were observed. The minimum flow rate detectable by the bubble flow meter was 10 milliliters per minute (ml/min).

An alternative method for measuring gas flow was developed because the initial plan (measurement of flow through the gas manifold) did not register measurable gas flow. The second technique for vent flow determination was initiated on September 16,

2012. This consisted of attaching a 1-liter Tedlar bag to the terminus of RCRA Vent 2 at 17:32 on September 16 and retrieving it at 10:00 on September 18, 2012. At 16:30 on September 18, 2012, a GasTech Sensidyne sampling pump with a known volume per stroke was used to extract the volume of gas collected in the Tedlar bag; that volume was approximately 175 ml. With a deployment period of approximately 40.5 hours, the net gas flow rate from RCRA Vent 2 was calculated at 4.3 ml/hr. The measurement period included both rising and falling barometric conditions.

A second Tedlar bag measurement was made on RCRA Vent 2 during a period of falling barometric pressure between 11:20 and 17:00 on September 18, 2012. The volume of gas extracted from that bag using the sampling pump was approximately 25 ml. The measured gas flow rate for the second test was 4.4 ml/hr.

2.2 Field Screening Method

Portable direct reading instruments (MX6 I-Brid™ and RKI Eagle 2 monitor) were used to screen for analytes of concern in order to ensure protection of sampling personnel and to survey the landfill perimeters to assess current conditions and identify locations that could pose a potential health and safety concern for field personnel at the Site.

Each landfill perimeter fence was walked with the MX6 I-Brid™/RKI Eagle 2 monitors in survey mode with time-stamped datalogging for those gases amenable to field instrument monitoring. Global Positioning System (GPS) data were also recorded with a synchronized time stamp. The hand-held monitors were held at waist level, approximately 3 feet above ground surface (ags) during the survey. The surveyor began the survey at the gate to each landfill. The surveyor stopped every 200 feet to allow the monitors to collect a stabilized reading before proceeding.

Per the approved SAP, if significant indications of landfill associated gases were noted during the perimeter monitoring (i.e., any detection of hydrogen cyanide or hydrogen sulfide or greater than 5% lower explosive limit (LEL), then a field screening colorimetric tube for hydrogen fluoride was to be collected at that location.

The full suite of gases listed above was tested for both LEL conditions (via hand-held monitors) and for toxicity characteristics. Nitrogen content was calculated by subtracting major gas percentages from the typical gas concentration of ambient air.

2.2.1 Handheld Instrument Data Transmission Technique

The large number of data entries required when using the hand-held instruments, along with the required use of Level B Personal Protective Equipment (which limited the ability to communicate verbally), required establishment of a hand signal system to transmit data from the instrument operators to the personnel recording data. The system agreed upon was as follows: after approach to each individual sampling point, a "thumbs up" signal would be given if and only if: 1) All monitored concentrations except oxygen were "zero" and 2) oxygen was 20.9 percent by volume. If any parameter besides oxygen was above the detection level of the handheld gas detection instrument used to measure it, the operator was to stop, retreat closer to the individual recording the data, state the parameter and concentration, and then give the "thumbs up" signifying that all other parameters were zero and oxygen was 20.9 percent by volume.

2.3 Air Sampling Method

Analyses for eight target analytes (acetylene, ammonia, carbon dioxide, hydrogen, hydrogen sulfide, methane, nitrogen, and oxygen/argon) in ambient air and landfill gas samples were performed by ALS Environmental (formerly Columbia Analytical Services) in Simi Valley, California. Analyses of hydrogen cyanide, hydrogen fluoride, and phosphine in ambient air and landfill gas samples were performed ALS Environmental at their Salt Lake City, Utah laboratory. The Simi Valley laboratory is American Industrial Hygiene Association (AIHA) and National Environmental Laboratory Program (NELAP) certified, and the Salt Lake City laboratory is AIHA certified.

Table 1 (Air Sampling and Monitoring Methods) details the sampling procedures, analytical methods, and holding times employed for these activities. Sample fractions to be analyzed for acetylene, carbon dioxide, hydrogen, methane, nitrogen, hydrogen sulfide (using ASTM Method 5504-08) and oxygen were collected in a Summa canister. Sample fractions to be analyzed for hydrogen fluoride, hydrogen cyanide, hydrogen sulfide (using method Occupational Safety and Health Administration [OSHA] 1008), and phosphine were collected with sorbent tubes. Sample fractions to be analyzed for ammonia were collected with a treated Anasorb tube. The collection of samples using a Summa canister instead of a Tedlar bag is discussed in detail in Section 4.3.1.

2.4 Source Area Sampling Method

Source area samples were collected from the RCRA Landfill sump (located within the RCRA utility building), the three RCRA Landfill vents, the four CERCLA Landfill manholes, two lift stations and the nutrient shed (see Tables 6 and 7).

Source area samples from the RCRA Landfill vents were obtained from a depth of approximately 6 feet within the vent pipes. The vent cap and elbow were removed, and Teflon tubing was extended to approximately 2.5 to 5 inches above the bottom of the vent. To collect samples from the CERCLA manholes and lift stations, the entire sampling train was lowered on a tray into the area to be sampled. This approach was adapted from the SAP-specified approach (lowering a tube down the manhole to collect samples) in response to EPA's concerns that the tubing introduces a bias. This modification is further discussed in Section 4.3.3.

2.5 Air Monitoring and Sampling Locations

Figure 2a shows the RCRA Landfill sampling locations. Figure 3a shows the CERCLA Landfill sampling locations. A unique sample identification number was assigned to each sample fraction submitted for laboratory analysis. Use of the monitoring location identifications enables efficient correlation of laboratory analytical results to monitoring locations. A table comparing the laboratory identification number to the monitoring location is provided with the sample collection records in Appendix A, laboratory data packages in Appendix C, and the data validation reports in Appendix D.

2.5.1 RCRA and CERCLA Landfill Perimeters

Ambient air conditions were monitored using hand-held instruments approximately every 200 feet around the perimeters of the RCRA and CERCLA Landfills. A total of 10 locations were monitored at the RCRA Landfill, and a total of 19 locations were monitored at the CERCLA Landfill. Using the results of the field monitoring and the on-Site meteorological data, one upwind and three downwind locations were selected at each landfill fence line for the collection of ambient air samples to be submitted for laboratory analysis, for a total of eight ambient air sampling locations. Monitoring and air sample collection locations are presented on Figures 2b (RCRA Landfill) and 3b (CERCLA Landfill). The following perimeter monitoring locations were selected for the collection of ambient air samples submitted for laboratory analysis:

- RCRA Landfill: Locations 4, 5, and 6 (downwind), and location 10 (upwind); and

- CERCLA Landfill: Perimeter locations 2, 16, and 18 (downwind), and location 11 (upwind).

2.5.2 RCRA and CERCLA Landfill Surface and Buildings

Target constituents were measured using hand-held instruments at the following locations:

- Adjacent to the RCRA Landfill sump
- RCRA Landfill vents (Vents 1, 2, and 3), and Cap Drains (Cap Drains 1 through 6)
- RCRA Utility Building: sample was collected in the sump at a depth of approximately 18 inches below land surface (bls) which is approximately midway between the leachate and the top of the sump.
- Adjacent to the CERCLA Landfill four manholes and two lift stations
- Within the Nutrient Shack and CERCLA Utility Building

Structure interiors were monitored at entry points to the building including cracks, seams, wall vents, utility penetrations (e.g., water lines, sewer lines, conduits), and the edge of the slab where it meets the exterior walls. For the RCRA Utility Building, probes were attached to the monitors and extended into the structure through two wall vents. Once initial measurements were taken, the building was opened to monitor interior conditions and sump gases.

Near-source extractive air samples were collected at the “worst case” RCRA landfill vent, CERCLA manhole, and CERCLA lift station per the SAP. These locations are shown on Figures 2c and 3c. RCRA Landfill Vent 2 and CERCLA manhole 2 were selected as the “worst case” locations for extractive sampling because field instrument measurements for hydrogen were high relative to the other vents and manholes. There were no notable instrument detections at Lift Stations 1 and 2. Lift station 1 was selected for extractive sampling because it is the point from which leachate is pumped to the CERCLA tank.

2.5.3 RCRA Landfill Vents and CERCLA Manholes and Lift Stations

Source area samples were collected at the three RCRA Landfill vents, and at the CERCLA Landfill four manholes and two lift stations. Additional specifications for these sampling locations are presented below:

- RCRA Landfill Vent 1: sample was collected in the pipe at a depth of ~6 feet bls. "A" and "B" designations refer to sample durations of 3 hours and 1 hour, respectively. Two samples were collected as lower volume samples (shorter duration) would minimize breakthrough; the higher volume (longer duration) would provide better sensitivity and temporal representativeness.

- RCRA Landfill Vent 2: sample was collected in the pipe at depth of ~6 feet bls. "A" and "B" designations refer to sample durations of 3 hours and 1 hour, respectively.

- RCRA Landfill Vent 3: sample was collected in the pipe at depth of ~6 feet bls. "A" and "B" designations refer to sample durations of 3 hours and 1 hour, respectively.

- CERCLA Manhole 4: sample was collected at a depth of ~10 feet bls.

- CERCLA Manhole 4: sample was collected at a depth of ~10 feet bls (duplicate).

- CERCLA Manhole 1: sample was collected at a depth of ~10 feet bls.

- CERCLA Manhole 2: sample was collected at a depth of ~10 feet bls.

- CERCLA Manhole 3: sample was collected at a depth of ~10 feet bls.

- CERCLA Lift Station 1: sample was collected at a depth of ~10 feet bls.

- CERCLA Lift Station 2: sample was collected at a depth of ~10 feet bls.

3. Results

This section presents the data gathered during the field monitoring and extractive sampling conducted at the Site.

3.1 Field Monitoring Data

Real-time measurements collected using hand-held instruments at the RCRA and CERCLA Landfills are presented in Tables 2 and 3. Conditions at a total of 87 locations at the RCRA Landfill and 141 locations at the CERCLA Landfill were assessed in real time using field monitoring equipment.

The field data were provided to the EPA within the required 5-day submittal date in the Field Data Report submitted by Lockheed Martin on September 28, 2012. Corrections to the RCRA Landfill results table were provided on October 4, 2012. Since the initial submittal, Tables 2 and 3 presented in this report have undergone a rigorous quality assurance (QA) review of the field data. QA checks revealed some discrepancies regarding instrument detection limits in the preliminary field monitoring data tables. These instrument detection limits have been corrected. Changes to the field data contained in the tables in the Field Data Report are listed below:

- All non-detect values were previously reported as "< 0.17 ND" in either % or parts per million (ppm), dependent on the gas monitored. All non-detect values, with the exception of hydrogen fluoride, were changed to the detection limit of the air monitoring equipment and reported at the manufacturer specified detection limit for each compound in their respective units. Non-detects for hydrogen fluoride were reported as "< 0.17 ND" in accordance with the detection limit of the Sensidyne Colorimetric Tube.

- Monitoring values that were initially recorded as not measured (NM) in the results tables due to no data entry in the sample logs were changed to "Standard Signal ND." This change is in accordance with the hand-held data transmission technique presented in Section 2.2.1.

- Several sample locations had gas concentration values entered as "< 0.1 ND." The QA review revealed low-level detections for these gases in the sampling logs. The correct values were included in the revised tables.

- Several sample locations had the concentration values for carbon dioxide and hydrogen fluoride recorded incorrectly as"0.1 ppm" and "< 0.17 ND", respectively. These values were reversed from the recorded values on the sample logs, and the revised tables were corrected accordingly.

- Flow measurements at the three RCRA Landfill Vents were removed from the table. These results are presented and discussed in detail in Section 2.1.

- A transcription error from the field notes was corrected for hydrogen sulfide at the Vent 1 sample collected at 1252 – 1330 on September 14.

- Sample results for sample characterization for shipping classification have been moved to a separate section of Table 2, along with gas flow monitoring results

3.2 Air Sampling Laboratory Data

Laboratory analytical results for air (ambient, near-source, and source) samples collected in September 2012 are summarized in Table 4 for samples collected from the RCRA Landfill area, and Table 5 for samples collected from the CERCLA Landfill area. A discussion of the comparison of the results to screening levels is provided in detail in Section 5.

The complete analytical results are presented in Appendix C as Tables C-1 through C-4. As detailed in the appendix, the sorbent sample data tables (C-1 and C-2) list results in two columns. The first is the result reported by the laboratory, which was determined using the actual sample volume listed on the COC form. The second is an adjusted result based on a standard sample volume, in which the field measured volume is adjusted to a standard temperature (68°F) and pressure (29.92 inches of mercury). Actual and standard sample volumes are also listed in the sorbent data tables; the standard volumes are approximately 1 to 3 percent lower than the actual volumes. The adjusted analytical results are thus approximately 1 to 3 percent higher than the lab-reported results. The second column also lists qualifiers resulting from the third-party data validation.

The formula used to calculate the standard sample volume (from U.S. EPA Compendium Method IO-2.4, at http://www.epa.gov/ttnamti1/files/ambient/inorganic/mthd-2-4.pdf) is as follows:

$V_{std} = (V_s)(P_{atm}/P_{std})(T_{std}/T_{atm})$, where:

V_{std} = volume of gas sampled, corrected to standard pressure (P_{std}) and temperature (T_{std}),

V_s = volume of gas sampled at atmospheric pressure (P_{atm}) and temperature (T_{atm})[3]

3.3 On-Site Weather Monitoring Data

Meteorological data were obtained from an on-Site meteorological (met) recording station (Figure 1). The on-Site met station was active from September 13 at 17:00 until September 21 at 09:00; however, it was not active during the initial monitoring conducted on September 13. Meteorological parameters recorded during sample collection included wind speed and direction, barometric pressure, and temperature. Wind roses were created from on-Site met station data for each day only for the hours during which samples were collected.

Air monitoring and sample collection were performed during periods of falling barometric pressure. Therefore, a Site-specific weather forecast was reviewed each morning prior to sampling. Very little synoptic-scale weather changes occurred over the duration of the sampling program; however, a repeated pattern of warm to hot days and clear, cool nights produced a fairly predictable and repeatable diurnal pressure cycle characterized by rising pressure overnight followed by pressure falls in the range of 0.09 to 0.26 inch of mercury, generally between the hours of 10:00 through 19:00 local time. The barometric pressure chart provided in Appendix E shows the sampling time intervals superimposed over the diurnal pressure cycle for the period of September 13 through September 21.

Awareness of wind direction was required for on-Site workers approaching and working in the vicinity of source areas and vents. Per the HASP, workers were to approach sources and RCRA Landfill vents and work from upwind whenever possible. Wind direction was also required to determine sampling locations for upwind and downwind ambient sampling locations at the fence lines. Flagging established along the perimeter fence lines was used throughout the sampling period to correlate with data from the met station and confirm wind direction. Sampling operations were adjusted as necessary to reflect changing wind direction conditions.

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[3] U.S. EPA (1999). Compendium of Methods for the Determination of Inorganic Compounds in Ambient Air; Compendium Method IO-2.4; Calculations for Standard Volume. Center for Environmental Research Information, Office of Research and Development, U.S. EPA. EPA/625/R-96/010a. June.

Complete on-Site meteorological data recorded during the sampling event, including wind roses, are provided in Appendix B.

4. Data Quality Assessment

4.1 Summary of Independent Third-Party Data Validation

This section addresses the results of the data validation effort for the air samples collected from the Site in September 2012. Fifteen analytical data packages were generated based on the field activities associated with the air sampling: Level IV data validation approach of the data packages as described in USEPA "Contract Laboratory Program National Functional Guidelines (NFG) for Inorganic Superfund Data Review" (OSWER9240.1-51, EPA 540/R-10-011, January 2010) was performed to include 100 percent review of holding times and sample integrity, calibration (initial and continuing), blanks (field and lab), laboratory control samples. In addition, 10 percent of the sample results were manually verified. Trillium, Inc., an independent, third-party firm was subcontracted to perform a Tier IV level data validation. The EPA was notified of the selection of Trillium, Inc., as the independent data validator in accordance with the SAP. The results of the Level IV data validation indicate that the laboratory samples analyzed are valid for their intended use with the exceptions related to data qualifiers summarized and noted below (data qualifiers are provided in full in Appendix C):

- Hydrogen sulfide by ASTM 5504-08 in samples S-4, S-9R, S-10R, S-12, S-13, S-14, S-15, and S-16 was analyzed after the recommended 7-day hold time, as further detailed in Section 4.3.1. Non-detect results were qualified UJ-.

- Results for ammonia in NH_3-5A, NH_3-5B, NH_3-6A, NH_3-6B, NH_3-7A, and NH_3-7B were qualified as estimated and biased low (J-) due to possible breakthrough.

- The result for hydrogen cyanide in HCN-7 was qualified as estimated and biased low (J-) due to apparent breakthrough.

- Results for hydrogen fluoride in HF-5, HF-6, and HF-7 were qualified as estimated and biased low (J-) due to apparent breakthrough.

- The results for phosphine in PH3-8, PH3-10R, PH3-17, PH3-22, PH3-23, PH3-24, PH3-25, PH3-26 and Field Blank-4 were qualified as non-detected at the reporting limit and estimated (UJ) due to the presence of phosphorous at comparable levels

in the associated method blanks to the level of phosphorous in the samples. In method 1003 phosphine is measured as phosphorous.

- The result for hydrogen sulfide in H2S-24 was qualified as estimated and biased high (J+) due to consistent low-level contamination observed in the chromatograms for the associated method blank and all other samples in this data set.

4.1.1 Additional Findings

The data validation noted that, in some cases, COCs were incomplete (missing sample dates/times), illegible, or incorrectly amended. Although there were shortcomings in the documentation accompanying the samples, this information was documented in the field logs and on sample labels. Therefore, this finding does not impact the integrity or usability of these data.

4.2 Evaluation of Field Modified Collection Methods for Vents and Manholes

The approved SAP called for sampling at the CERCLA manholes and lift stations by inserting tubing from the surface to approximately 10 feet below ground surface. The SAP required sampling from "5 to 10 feet for the vent pipe itself" for the RCRA vents, but did not specify the use of tubing. As noted in Section 2.4, samples were collected via tubing at the RCRA landfill and by lowering the samples devices into the manhole at the CERCLA locations. After EPA expressed concern regarding the position of the sample tubes on the backside of the sample tubing, ARCADIS collected concurrent samples using different methods to evaluate whether the use of the Teflon probe to collect samples would result in either a positive or negative interference. These concurrent samples were collected at CERCLA Lift Station #1 (see sample numbers 23 and 26) on September 20, 2012. The results of these concurrent samples are shown in Table 10 and 11 and further discussed below.

The first sample set (sample number 23) was lowered (sample pumps, sampling media, interconnecting tubing, Summa canister in a basket) approximately 10 feet into Lift Station 1, with the sampling pumps started on the surface prior to lowering. For the second sample (sample number 26), the sample media remained at the surface with the actual sample being extracted through a 10-foot Teflon probe, the tip of which was lowered down into Lift Station 1 to within approximately 1 foot of the location of the first sample set as described in the approved SAP: "Data will be collected via tubing extended to approximately 10-feet below the surface elevation."

As shown in Table 6, the sample collected with the Summa canister lowered physically into the lift station was moderately higher in carbon dioxide and lower in oxygen/argon than the sample collected through the Teflon tubing. Oxygen/argon concentrations measured in the two samples are similar; therefore, the alternate sampling method does not represent any introduction of sample bias for this compound. The difference in the measured concentration of hydrogen fluoride was greater using the Teflon tubing. There is a physically credible mechanism for the introduction of this compound from Teflon tubing because hydrofluoric acid is used in the manufacture of Teflon. The review of the hydrogen fluoride results associated with the RCRA Landfill vent samples showed that, although it was detected in those samples, the measured concentrations were lower than its health-based screening level applicable to ambient air. Therefore, any positive interference associated with the use of Teflon tubing does not materially affect the conclusions of this assessment.

As discussed previously, using the Teflon tubing for sampling through the RCRA Landfill vents was necessary due to the limited diameter of the vent pipes themselves.

4.3 Deviations from SAP

Deviations from the QAPP for sampling and laboratory analysis are discussed in detail in the subsections below.

4.3.1 Hydrogen Sulfide Results by ASTM Method D-5504-08 vs. OSHA 1008 (Includes also discussion of Summa Canister vs. Tedlar Bag Choice for Other Analytes)

The SAP left open the potential to use either Tedlar bags or Summa canisters for collection of samples for analysis of acetylene, carbon dioxide, hydrogen, methane, oxygen, and nitrogen. The SAP listed two methods for hydrogen sulfide analysis: OSHA-1008 and Tedlar bag sampling with analysis by ASTM D-5504. The initial discussion with the laboratory and the field team was that Tedlar bags would be preferred for certain potentially high concentration samples to avoid potential damage/contamination of Summa canisters. Further, it was noted that: “Exception Shippers” were available to allow legal common carrier shipment of Tedlar bags containing flammable samples, but that no such device was available for Summa canisters. However, in the field, after discussion between the ARCADIS field team and the Lockheed Martin field representative, it was decided that Silonite-coated Summa canisters were preferred because of their longer holding time for most parameters. However, some samples had already been collected in standard Summa canisters that were not Silonite-coated.

Given that field data previously collected at this Site in 2005 indicated the presence of gases that could be considered flammable or toxic at certain concentrations, a careful Department of Transportation (DOT) shipping determination was necessary. Summa canisters may only be shipped by air by common carrier if they are assessed to be non-hazardous for transportation purposes. For these mixed gases, this determination required that field data be used in two separate calculations; one that assessed vapor inhalation of mixtures under DOT/International Air Transport Association (IATA) rules, and another to assess flammability of the mixed gasses based on the ISO 10156 methodology as cited by the International Civil Aviation Organization (ICAO)/IATA. This effort required several days to complete, which delayed the shipment time for the Summa canisters. This resulted in the laboratory receiving some of the samples for hydrogen sulfide from the RCRA Landfill outside the 7-day holding time for ASTM method 5504-08. However, this potential data quality issue was avoided by analyzing samples for hydrogen sulfide using OSHA method 1008 and achieving laboratory reporting limits that met data quality objectives. The detection limits achieved by the laboratory for hydrogen sulfide using OSHA Method 1008 were considerably lower than noted in Table 1 of the SAP and were comparable to the detection limits noted for ASTM method D-5504-08.

4.3.2 Field Monitoring for Methane

Methane was measured in the field using both the MX-6 IBRID meter and the RKI Eagle, whereas Table 1 of the SAP only identified use of the RKI Eagle for methane. Both the MX-6 IBRID and RKI Eagle were calibrated similarly for methane. Methane as an individual gas was measured in the field using the MX-6 IBRID meter. Methane as part of the LEL was measured in the field with the RKI Eagle. There is no adverse impact on the assessment as a result of using both meters as methane concentrations were measured at all target locations and the detection limits of the two instruments for methane are comparable.

4.3.3 Sampling of CERCLA Sources

The SAP stated that the four manholes and two lift stations at the CERCLA landfill would be sampled by extending tubing to approximately 10 feet below the surface elevation. However, after EPA expressed concern in the field regarding the position of the sample tubes on the backside of the sample tubing, the sample method was modified so that the sample media (sample pumps, sampling media, interconnecting tubing, and Summa canister) were lowered into the sources in a basket to approximately 10 feet below ground surface.

This modification dictated closer examination of the sample method that had been previously used for the RCRA vents (sample tubing extending approximately 6 feet into the sources with sample canisters, pumps, and tubes at the ground surface). Therefore, as discussed previously in Section 4.2, a comparison test of sample methods was performed at Lift Station 1 by concurrently sampling Lift Station 1 using both techniques.

4.3.4 Lost Samples in Field

During collection of the sample and duplicate within CERCLA Manhole 4, the duplicate sample fraction for phosphine was accidentally knocked off the tubing holding it to the sample pump. It fell into the manhole and could not be retrieved. No attempt was made to re-sample because the lost sample was a duplicate, and its original purpose could not be re-created by another sample at a different time. The primary sample fraction for phosphine at this location was retained and analyzed. There was no adverse impact to the project assessment, as the sample was collected and analyzed as planned.

The sample fraction for hydrogen sulfide collected within the sump at the RCRA Utility Building (H2S-3) failed due to a pump malfunction. A replacement sample (H2S-3R) was collected the next day; therefore, there was no adverse impact to the project objectives.

4.4 Review of Field Documentation

4.4.1 Chains of Custody

Date and time information provided on COC forms was sometimes incomplete. Two discrepancies were found in the recording of sample volumes on the COC forms.

- Sample HF-15: the volume reported in the field notes as 208.76 L was entered on the COC and by the lab as 208.7 L. The difference between the two values is 0.03 percent.

- Sample PH3-1: the volume reported in the field notes as 181.19 L was entered on the COC and by the lab as 181.9 L. The difference between the two values is 0.39 percent.

These discrepancies had no impact on the overall data quality or usability.

4.5 Field Monitoring Instrument Calibration Procedures

Field monitors were calibrated per manufacturer's instructions and documented in the field notebook prior to the monitoring event. A calibration test was performed before each day's use to confirm the monitor's ability to respond to gas by exposing the detector to a gas concentration within the calibration range. Manufacturer's instructions for calibration and purging were followed during the real-time monitoring event. The combustible sensor was checked with a known concentration of calibration gas after any known exposure to catalyst contaminants or poisons.

Calibration gas for the hydrogen sensor in the RKI Eagle meter was not available during the monitoring event; ARCADIS was unable to obtain the proper hydrogen calibration gas on-Site during the project. The hydrogen gas available on Site was too high in concentration for the range of the RKI Eagle meter, and using it would have damaged the hydrogen sensor. While the hydrogen sensor was not calibrated on Site, it was calibrated by the manufacturer prior to the instrument's use in the field.

Monitoring was conducted according to the following procedure:

- The field monitors zeroed prior to the start of every day, if necessary.
- Concentrations of the target analytes were read and recorded as the perimeter sampling was being conducted at both the RCRA Landfill and the CERCLA Landfill. Extractive samples were collected for toxicity analyses after hand-held gas monitoring was completed.
- Monitors were purged until the readings stabilized

5. Hazard Screening

The hazard screening was conducted in accordance with the EPA-approved SAP. The first objective of the SAP was to obtain data to evaluate the potential exposure of Site workers, off-Site workers, or residents to toxic and/or asphyxiating gases. Consistent with the SAP, the hazard screening included an exposure pathway analysis and data analysis to evaluate potential health hazard to on-Site and off-Site workers and residents. These elements are discussed in Sections 5.2.1 and 5.2. The second objective of the SAP was to evaluate the potential for auto-ignition and/or fire from explosive gases. Accordingly, a flammability assessment was conducted and is presented in Section 5.3. The third objective of the SAP was to evaluate the impacts of

the various *in situ* treatment methods employed at the RCRA and CERCLA Landfills and leachate systems. The data presented herein support that goal; however, it cannot be used to assess treatment activities that have ceased, including the pilot CO_2 injection during the 2004-2005 period and the venting that ceased in early 2011. The only currently active treatment is the addition of a carbon substrate (molasses and methanol) in the CERCLA Landfill LCS.

5.1 Exposure Pathways

Potentially complete inhalation exposure pathways were identified in the baseline risk assessment completed for the MMRF, of which the RCRA and CERCLA Landfills are a portion[4]. The pathways evaluated in the baseline risk assessment were considered in the preparation and implementation of the SAP. In addition, pathways were identified based on a review of current land use surrounding the landfills; updating the historical evaluation.

Current land use surrounding the RCRA and CERCLA Landfills is industrial as described in the SAP. The Landfills are closed and surrounded by a 6-foot chain-link fence, and posted in English and Spanish "Warning Authorized Entry Only." The chain-link fence is topped by three strands of 45-degree angle barbed wire. The landfill fences are formally inspected quarterly and informally inspected routinely (typically more than once per week).

The CERCLA Landfill, former Scrubber Sludge Ponds, RCRA Landfill, and CERCLA Tank area are almost completely surrounded by industrially-zoned land currently owned by NWA. An office trailer used for meetings supporting industrial activities at the NWA property is located approximately 50 feet outside the RCRA Landfill fence on the west side of the landfill. The closest residential area is located to the southwest approximately 0.25 mile from the nearest landfill perimeter. The prevailing wind direction is from the northwest; based on prevailing winds, the nearest residents are cross-wind from the Site. Based on the land use and Site characteristics discussed above, as well as Section 2 of the SAP, receptors potentially exposed to Landfill gases are:

[4] Clement Associates, Inc. 1988. Risk Assessment - Martin Marietta Reduction Facility, The Dalles, Oregon.

- On-Site workers including:
  - Air monitoring workers (i.e., those workers implementing the SAP over a 2-week period)
  - Environmental O&M workers (part-time to maintain closed Landfills and collect groundwater data)
  - Temporary on-Site utility workers to service power lines
- Infrequent Site visitors (i.e., owners representatives and regulatory agency staff)
- Off-Site workers
- Residents (intermittent depending on local variability in wind conditions)

The exposure duration for infrequent Site visitors and utility workers is much lower than that of on-Site workers. Therefore, for screening purposes, the following receptors were considered:

- On-Site environmental worker
- Off-Site worker
- Resident

5.2 Screening Approach and Results

5.2.1 On-Site Environmental Workers

On-Site workers were divided into workers implementing the SAP and other on-Site workers (e.g., O&M workers). Potential exposure for those workers implementing the SAP was evaluated by comparison of real-time, direct-read instrument results from the breathing zone with action levels based on occupational exposure limits and established in the HASP Addendum (see Table 2 in Appendix C of the SAP).

Worker exposure for other on-Site workers was evaluated by comparison of laboratory analytical results with short or long-term screening levels, as follows:

- Results from near-source sampling that is not in a normal breathing zone (e.g., at a height of 1 foot above ground surface) are compared to short term/acute exposure screening levels

- Results from all other samples inside the landfill fence lines are compared to short term/acute and long term industrial worker screening levels

Table 1 provides both short-term/acute exposure screening values and long-term industrial exposure screening values that were specified in the SAP.

5.2.1.1 Screening Results – Field Measurements

Measurements obtained from worker breathing zones using real-time, direct-read field instruments are summarized in Tables 2 and 3. All breathing zone field measurements at the RCRA Landfill and at the CERCLA Landfill were non-detect or below industrial work action levels, except for three locations. An instrument measurement was made inside the tank at the CERCLA Nutrient Shack, which exhibited elevated hydrogen sulfide; however, this is not within the breathing zone of on-site workers.

5.2.1.2 Laboratory Results

RCRA Landfill. Laboratory analytical results for samples collected at the RCRA Landfill are presented in Table 4. Results from near-source sampling locations at the RCRA Landfill were compared with the short-term/acute exposure screening levels. Only ammonia was detected at a concentration (1.76 milligrams per cubic meter [mg/m^3]) exceeding the ATSDR acute minimal risk level (MRL) of 1.18 mg/m^3 in one sample collected from just outside Vent 2 at vent-height and 1 foot from the opening (Figure 2a). Ammonia was not measurable in the breathing zone near Vent 2 (height of 5 feet ags and distance of 5 feet from the vent) using a field instrument one day earlier. Oxygen and argon combined results were 21.5 percent in samples collected adjacent to the sump and Vent 2 (Figure 2a). These results are reasonable given the normal oxygen concentration of 20.9 percent and argon concentration of 0.9 percent found in the earth's atmosphere. All other chemical results for near-source samples summarized in Table 4 were less than the corresponding short-term exposure screening levels.

CERCLA Landfill. Laboratory analytical results for samples collected at the CERCLA Landfill are presented in Table 5. Results from near-source sampling locations at the CERCLA Landfill were compared with the short-term/acute exposure screening levels. Oxygen and argon results ranged from 21.5 to 21.6 percent in near-source samples from the CERCLA Landfill (Table 5; Lift Station 1 and Manhole 2, Figure 3c). These results are reasonable given the normal oxygen and argon concentrations found in the

earth's atmosphere. All other results for near-source samples from the CERCLA Landfill were less than the corresponding short-term exposure screening levels.

Results from the perimeter sampling locations and inside the Nutrient Shack at the CERCLA Landfill were compared with long-term/chronic exposure screening levels to evaluate chronic health hazard, as well as screening levels to evaluate potential asphyxiation hazard, to on-Site workers (Table 5). All results for CERCLA Landfill perimeter and Nutrient Shack samples are less than their corresponding screening levels.

5.2.2 Off-Site Worker

Exposures of off-Site workers were evaluated by comparison with the long-term chronic exposure screening levels shown on Table 1.

5.2.2.1 Screening Results – Field Measurements

Measurements obtained from worker breathing zones using real-time, direct-read field instruments are summarized in Tables 2 and 3. All breathing zone field measurements at the RCRA Landfill and at the CERCLA Landfill perimeters were non detect or below industrial work action levels, except for two locations. The upwind RCRA landfill fence line sample detected ammonia at 1 ppmv and the fence line sample at the CERCLA tank also detected ammonia at 1 ppmv.

5.2.2.2 Laboratory Results

The results of the hazard screening based on laboratory analyses are summarized below.

RCRA Landfill. All results for RCRA Landfill perimeter samples (Table 4) were less than applicable screening values.

CERCLA Landfill. All results for CERCLA Landfill perimeter and Nutrient Shack samples (Table 5) were less than their screening levels.

5.2.3 Residential

As noted in Section 5.2.2, the perimeter results for the RCRA and CERCLA Landfills presented in Tables 4 and 5 met applicable long term industrial screening levels.

Based on the additional dispersion that would be expected in the greater than 1,000 foot distance to the nearest residence, it is unlikely that there is a significant hazard to residents.

5.3 Hazard Screening Findings

The key findings of the hazard screening are:

- Laboratory data from samples collected at RCRA and CERCLA landfill fence lines did not exceed short-term or chronic screening levels. Therefore, perimeter results indicate minimal potential for adverse health effects to nearby residents, off-Site workers or on-Site workers performing routine maintenance activities, which do not include activities adjacent to the RCRA Landfill vents.

- Screening levels were exceed for ammonia at two locations, one at the RCRA fence and one at the CERCLA tank fence using the field monitoring instruments.

- Ammonia potentially poses an intermittent acute inhalation hazard to on-Site workers in the vicinity of RCRA Landfill Vent 2. However, ammonia was not measureable at the detection limit of 1ppm in the breathing zone using a field instrument (i.e., 5 feet from the vent).

5.4 Limitations

The principal sources of uncertainty in the hazard screening presented above are:

- The single sampling event does not account for potential long-term temporal variability in concentrations. The direction of bias associated with this uncertainty is unknown. However, the data were collected under falling or stable barometric pressure conditions, and the samples were time-integrated over several hours.

- Screening samples were collected/monitored for shipping determinations at the RCRA landfill vents. As the shipping determination needed to be done prior to collecting extractive laboratory samples, the field monitoring instruments were used to screen samples that were collected over an extended period of time relative to other sampling conducted at the Site. These results indicated elevated levels of some constituents relative to other monitoring and sampling conducted at the site in accordance with approved SAP methodology. These results are not directly comparable to other monitoring/sampling conducted at the site, and the

effect temporal variability may have on these results is difficult to ascertain given the sampling methodology employed. These results were similar to sampling results reported in the SAP from July 2012.

- Wind speeds and direction were not consistent with prevailing conditions. Additionally, ambient air conditions were degraded from nearby wildfires.

- Reporting limits for certain compounds in ambient samples were elevated relative to industrial air ambient screening levels (Table 1). For example, no commercially available sampling or monitoring method can reliably detect phosphine down to the EPA chronic regional screening level (RSL) for industrial workers 1.3 µg/m^3 (0.94 ppbv). As indicated in the approved SAP, neither the OSHA extractive method nor the field instrument can reach that sensitivity. The laboratory reporting limit for the OSHA method as implemented was approximately 12 to 36 µg/m^3. Method blank levels (as discussed in section 4.1) were very close to that reporting limit. Thus it is not possible to prove that the concentrations at the fence line are below the EPA chronic screening value for phosphine with the commercially available laboratory analytical method. Reporting limits for the remaining compounds were either below industrial air ambient screening levels or approached the screening level (e.g., the reporting limit for hydrogen sulfide was 11 µg/m^3 and the screening level was 8.8 µg/m^3).

- Limitations in the toxicity database support the RSLs. For example, EPA reports low confidence in the database and selected reference concentration for phosphine on which the RSL is based[5]. This may result in over- or underestimating toxicity and therefore hazard.

- Exposure assumptions for the long-term/chronic exposure screening levels are conservative when compared with Site-specific on-Site worker exposures. For example, the EPA RSLs for non-carcinogens assume exposures of 8 hours per day, 250 days per year for 25 years. Exposures of on-Site workers are much lower, with the most exposed on-Site worker present for approximately 15 hours per week. This screening approach results in identifying potential hazard for on-Site workers where none may be present.

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[5] USEPA. 2012. Integrated Risk Information System: Phosphine (CASRN 7803-51-2). Available online at: http://www.epa.gov/iris/subst/0090.htm.

5.5 Assessing *In Situ* Treatments

The third objective for this sampling event as stated in the SAP was to assess "the utility of the collected data to assess the chemistry of *in situ* treatment methods applied at the site." The data that were collected that can be used to address this object include: 1) the field and lab data regarding the landfill gas quality within the RCRA Landfill vents and the RCRA Landfill vent flow rates; and 2) the field and lab data from sample locations associated with the CERCLA Landfill LCS.

In situ treatment at the Site can be summarized as:

- Pilot test injections of carbon dioxide (CO_2) gas into the RCRA Landfill between 9/2/04 and 8/24/05
- Molasses application at the CERCLA Landfill LCS starting December 2004 to present
- Land application of molasses at the CERCLA Landfill from March 2002 through October 2007

Historic landfill gas quality data from the RCRA Landfill vents were collected prior to, during and following pilot injections of CO_2 gas into the RCRA Landfill. These results (included as an appendix in the SAP) indicate the following:

- Prior to pilot CO_2 injections, HCN was measured in the field from non-detect at all three vents (9/2/04) to as high as 976 ppm (Vent 3 on 9/1/04); H_2S was >100 ppm at Vents 2 and 3 on 9/1/04 and 9/2/04; and methane was >50,000 ppm at Vents 1 and 2 on 9/1/04 and 9/2/04.
- Following the start of pilot CO_2 injections on 9/2/04, HCN was measured in the field as high as >999 ppm (all three vents on 9/29/04 and 10/6/04 and at Vent 2 on 8/24/05 following the last of the CO_2 injections); H_2S was frequently >100 ppm at all three vents; and methane was only measured once, at Vent 2 on 1/12/05 at 100 ppm.
- More recently, on 7/7/12, all three vents were sampled in the field (after pilot CO2 injections had been discontinued). The highest readings were: 105 ppm of HCN at Vent 1; 96 ppm of methane at Vent 2; 60 ppm of H2S at Vent 3; and 0.08% CO2 at Vent 3.

These results coupled with the results in this report suggest that HCN concentrations in the RCRA Landfill gas were high prior to pilot CO2 injections, high or higher following the injections and have declined significantly since the injections ceased. This is an expected result when it is considered that the injection of CO2 likely decreased the pH of pore space water that was in contact with the landfill waste which would have favored an increase in HCN gas production from aqueous phase HCN present in the pore space water.

With regard to the anaerobic biological treatment of leachate at the CERCLA Landfill LCS, HCN gas may be generated during anaerobic biotreatment of aqueous HCN since there is typically a slight decrease in pH associated with this type of treatment. However, the sampling results presented in this report indicate there were no detections of HCN gas in the field or in lab samples collected within or adjacent to the CERCLA Landfill LCS components.

5.6 Vent Data Variability

Measurements of landfill gas quality from inside the RCRA Landfill vents occurred on three occasions during this sampling event: 1) 9/15 (field meters); 2) 9/16 (lab samples); and 3) 9/20 (field meters). The results from these three sampling times were highly variable. This section provides detailed descriptions of the sampling activities at these three times as well as a possible explanation for the variability and a proposed approach for additional sampling.

Sampling Details At 10:00 on September 15, 2012, field activities were initiated for RCRA Vent 2. Ambient conditions at the vent were screened with field instrumentation meters to verify safety of the breathing zone. The vent cap was removed, and the manifold pipe was attached to the end of the vent pipe by a threaded connection. The manifold contained four sample ports at the mid-point of the pipe, approximately three feet from where the manifold connected to the vent pipe. A reducer fitting that terminated with a sample port also was connected to the end of the manifold.

Following assembly of the manifold, sampling procedures began at Vent 2. A flow measurement from the vent pipe was attempted by connecting a bubble flow meter to the end of the manifold. The flow meter did not measure flow at the minimum flow rate of 10 ml/min. Next, the MX6 I-Brid meter was connected to one of the sample ports at the mid-point of the manifold pipe. The meter immediately indicated concentrations of hydrogen and phosphine that exceeded the upper quantitation limits of the meter. The meter also detected ammonia and hydrogen cyanide. Given the exceedance of the

upper limits for hydrogen and phosphine, the field team disconnected the meter from the manifold and withdrew from the vent to consider the implications of the readings.

The field team noted that the readings were obtained with no purging of the manifold, and hence the vent pipe; the MX6 I-Brid was connected to the manifold for approximately one minute and the measured concentrations occurred instantaneously. The rapid responses for hydrogen and phosphine prevented observation of a reading for methane, the other compound measured by the MX6 I-Brid. The other field meter, the RKI Eagle 2, was not connected to the manifold, thereby providing no measurements for oxygen, carbon dioxide, LEL, and hydrogen sulfide.

By approximately 11:00, the field team conceived of a feasible sampling procedure to safely collect samples from within the vent pipe as indicated in the SAP. Therefore, the manifold pipe was abandoned, and the field team spent the remaining portion of September 15 sampling the RCRA utility building and sump and constructing the equipment for sampling within the RCRA vent pipes.

The samples from all three RCRA Landfill vents for lab analysis were collected the following day, September 16.

On the final day of sampling activities, September 20, Arcadis pulled 200 ml of gas from Vent 2 into a Tedlar bag using a sample pump. The gas in the Tedlar bag was diluted to a 20:1 ratio with zero-grade nitrogen gas. A rotometer was used to meter the dilution. The diluted gas sample from Vent 2 was then measured using the MX6 I-Brid and RKI Eagle 2.

Data Variability Data from these three sampling events are provided in Tables 2 and 4. Vent 2 was sampled all three times and the results were variable. Significant differences among the Vent 2 results are summarized below [1) indicates the first meter reading, 2) indicates the lab result and 3) indicates the second field meter reading with a 20:1 dilution]:

- HCN: 1) 0.4 ppm; 2) <0.0018 ppm; 3) 440 ppm
- H_2: 1) >1,000 ppm; 2) 21,500 ppm; 3) >20,000 ppm
- NH_3: 1) 252 ppm; 2) 354 ppm (1-hour sample); 3) 2,240 ppm
- PH_3: 1) >10 ppm; 2) <0.008 ppm; 3) 5.2 ppm

- H_2S: 1) Not measured; 2) <0.0085 ppm; 3) 100 ppm

Possible Explanation of Variability Given the variability highlighted above over a period of 5 days, along with the similar historic data from the RCRA Landfill vents (see Section 5.5), it appears that while at times the gas within the three vents has very similar characteristics (see the 7/7/12 results in the SAP appendix), at other times there is very significant different gas quality, even in the same vent. The field team monitoring RCRA Landfill gas quality before, during and after the pilot test CO_2 injections in 2004-2005 noted similar variability in the data and noted in one of their results tables "Variations indicate "bubbles" or pockets of air contaminants trapped in upper bend of vent pipe." The variability in the density of the contaminants that have been monitored could account for some of the differences in results. The specific gravities of the compounds listed above at 1 atm. and 20°C are: HCN = 0.93; H_2 = 0.07; NH_3 = 0.59; PH_3 = 1.17; H_2S = 1.18. The lighter compounds (specific gravities <1) could accumulate at the top of the "J-tube" portions of the vents which would result in a slug of gas with higher concentrations of some compounds. In addition, it is very likely that there is considerable variability in the gases within the pore spaces of the landfill waste. The spent pot liner waste has a wide range of particle sizes which results in a wide range of pore spaces. As landfill gas moves within the landfill due to changes in barometric pressure and changes in temperature, pore gas from different parts of the landfill will blend and be transported to the vent system piping. This could account for at least some of the variability that we have observed in landfill gas quality over time.

6. Flammability/Auto Ignition Assessment

The measured concentrations of gases using hand-held instruments were less than the LEL at all fence line perimeter locations and those samples collected from within the RCRA Landfill vents, CERCLA Landfill manholes, and lift stations. In laboratory samples collected within the RCRA Landfill vents, concentrations of 1.67 through 3.11 percent hydrogen (LEL: 4 percent) and 1.81 to 2.66 percent methane (LEL: 5 percent) were observed. However, rapid decreases in concentration with distance from the sources were also observed. Hydrogen concentrations on the RCRA Landfill surface and at the perimeter were below the laboratory detection limit (approximately <0.2 percent). Methane concentrations observed at the Landfill perimeters were consistent with the global tropospheric average of 1.8 ppm as reference in http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-3-2.html.

Potentially flammable gases may be present within the RCRA Landfill; however, very low flows were measured during this sampling event at the three vents. The low levels of gases measured in ambient air near the vents are consistent with the low flow rates measured at the vents. However, very little temporal data for the landfill quality and quantity exists for the RCRA landfill vents. Changes in conditions, including more extreme barometric pressure drops, could result in an increase in pressure differential and flux out of the RCRA Landfill vents.

7. Discussion

The comparison of ambient air results to short-term and chronic health-based screening levels indicate that there is little to no potential for adverse effects to on-Site or off-Site workers during routine O&M activities. Single detections of ammonia at concentrations above short-term screening levels in near-source locations/samples indicate that there may be an intermittent acute hazard associated with exposures very near the RCRA Landfill vents (within 1 foot of the vents). The results of the hazard screening indicate that current health and safety protocols are protective of workers conducting routine O&M activities. As a standard practice, it is recommended that the HASP be updated to include the information gathered during this survey in the event that non-routine maintenance is required.

The monitoring results show that neither the combined flammable gases nor the individual gas concentrations exceed the LEL screening levels in ambient air. Potentially flammable gases may be present in the RCRA Landfill vent system based on screening and analytical results, but during the sampling period little to no landfill gas flow was observed at the three vents.

Engineering controls present at the Site (venting systems, lightning rods, fencing, locks, warning signs, sump float controls, and lock outs) based on monitoring and sampling data, are sufficient for protection of human health. These controls can be expected to remain protective given the current inspection and maintenance procedures in place at the Site.

Samples were collected during falling barometric conditions in accordance with the SAP. Flow measurements during this period showed little to no flow emitted from the RCRA Landfill vents. As noted in the SAP, falling barometric pressure is widely recognized to contribute to landfill outgassing; thus, collecting samples at a time of falling barometric pressures could be considered a worst-case indication of potential flux of gases from the landfills to the ambient air.

The sample results collected in CERCLA manholes and lift stations did not indicate any detections of hydrogen cyanide. This provides evidence that the biological treatment that is occurring in the CERCLA LCS is not leading to volatilization of hydrogen cyanide, and that the decrease in free cyanide concentration in the leachate is likely due to biological degradation.

ARCADIS

Tables

Table 1
Air Sampling and Field Monitoring Methods
Air Sampling and Monitoring Data Report
Lockheed Martin Corporation

Analyte Name	Analyte Abbreviation	Reason for Measurement	Analytical Method	Media/Container	Hold Time	DL/PQL	Industrial Worker Ambient Air Screening Level		Short-Term Air Screening Level	
							Screening Level	Source for Screening Level	Screening Level	Source for Screening Level
Air Sampling and Analyses[a]										
Acetylene	C_2H_2	**Explosive/Toxic**	EPA TO-3 M	Tedlar or canister	Tedlar: 72 hrs Canister: 30 days	0.5 ppm	2.5% v/v LEL	http://www.engineeringtoolbox.com/explosive-concentration-limits-d_423.html	2.5% v/v LEL	http://www.engineeringtoolbox.com/explosive-concentration-limits-d_423.html
Ammonia	NH_3	**Toxic**	OSHA ID 188/164	SKC-226-29	14 days at 4 ^oC	MRL = 0.010 mg/sample; at 3 hour sampling time and 0.5 liters per minute 0.16 ppmv (0.112 µg/m3)	440 µg/m^3	EPA Regional Screening Level** (RSL) Summary Table April 2012, Industrial Air	1,180 µg/m^3	EPA Acute Minimal Risk Level (MRL) www.atsdr.cdc.gov/mrls/pdfs/atsdr_mrls_February_2012.pdf
Carbon Dioxide	CO_2	**Asphyxiate**	ASTM D1946/ EPA 3C M	Tedlar or canister	Tedlar: 72 hrs Canister: 30 days	1,000 ppm	5,000 ppm, 9,000 mg/m^3	OSHA, 1910.100 Table Z-1, 8 hour TWA	30,000 ppm, 54,000 mg/m^3	ACGIH Threshold Limit Value (TLV) Short Term Exposure Limit (STEL) 15-minute TWA
Hydrogen Fluoride	**HF**	**Toxic**	NMAM 7903	SKC 226-10-03	21 days at room temperature	2.5 µg/m^3 (MRL 0.53 µg/sample)	61 µg/m^3	EPA Regional Screening Level (RSL) Summary Table April 2012, Industrial Air	820 µg/m^3	Acute Exposure Guideline Level 1 (AEGL 1) (transient effects), 8-hr, http://www.epa.gov/oppt/aegl/pubs/compiled_aegls_nov072011.pdf
Hydrogen	H_2	**Explosive**	ASTM D1946/ EPA 3C M	Tedlar or canister	Tedlar: 72 hrs Canister: 30 days	1,000 ppm	4.0% v/v LEL	http://www.engineeringtoolbox.com/explosive-concentration-limits-d_423.html	4.0% v/v LEL	http://www.engineeringtoolbox.com/explosive-concentration-limits-d_423.html
Hydrogen Cyanide	**HCN**	**Toxic**	NMAM 6010	SKC 226-28	14 days at room temperature	2 ppbv 2.2 µg/m^3 (MRL 0.21 µg/sample)	3.5 µg/m^3	EPA Regional Screening Level (RSL) Summary Table April 2012, Industrial Air	1,105 µg/m^3	Acute Exposure Guideline Level 1 (AEGL 1) (transient effects), 8-hr, http://www.epa.gov/oppt/aegl/pubs/compiled_aegls_nov072011.pdf
Hydrogen Sulfide	H_2S	**Toxic**	ASTM-D-5504-08	Tedlar or canister	7 days	4 ppbv (5.6 µg/m^3)	8.8 µg/m^3	EPA Regional Screening Level (RSL) Summary Table April 2012, Industrial Air	97 µg/m^3	EPA Acute Minimal Risk Level (MRL) www.atsdr.cdc.gov/mrls/pdfs/atsdr_mrls_February_2012.pdf
Hydrogen Sulfide	H_2S	**Toxic**	OSHA 1008	Sorbent Tube	14 days	520 ppbv (724 µg/m^3) (4-hr sample collection	8.8 µg/m^3	EPA Regional Screening Level (RSL) Summary Table April 2012, Industrial Air	97 µg/m^3	EPA Acute Minimal Risk Level (MRL) www.atsdr.cdc.gov/mrls/pdfs/atsdr_mrls_February_2012.pdf
Methane	CH_4	**Explosive**	ASTM D1946/ EPA 3C M	Tedlar or canister	Tedlar: 72 hrs Canister: 30 days	1,000 ppm	5%v/v LEL	http://www.engineeringtoolbox.com/explosive-concentration-limits-d_423.html	5%v/v LEL	http://www.engineeringtoolbox.com/explosive-concentration-limits-d_423.html
Nitrogen	N_2	**Balance gas**	ASTM D1946/ EPA 3C M	Tedlar or canister	Tedlar: 72 hrs Canister: 30 days	1,000 ppm	N/A	N/A	N/A	N/A
Oxygen[b]	O_2	**Asphyxiant**	ASTM D1946/ EPA 3C M	Tedlar or canister	Tedlar: 72 hrs Canister: 30 days	1,000 ppm	if > 19.5% v/v	http://www.osha.gov/dte/library/respirators/major_requirements.pdf	if > 19.5% v/v	http://www.osha.gov/dte/library/respirators/major_requirements.pdf
Phosphine	PH_3	**Toxic**	OSHA 1003	SKC 225-9018, treated filter	17 days at room temperature	22.9 µg/m^3 using a 240 liter sample (1 liter per minute for 4 hours) (MRL 5.5 µg/sample)	1.3 µg/m^3	EPA Regional Screening Level (RSL) Summary Table April 2012, Industrial Air	700 µg/m^3 max for 1-hr	http://www.aiha.org/insideaiha/GuidelineDevelopment/ERPG/Documents/2011erpgweelhandbook_table-only.pdf
Field Portable Monitoring										
Acetylene	C_2H_2	**Explosive/Toxic**	RIK Eagle 2 w/TC	N/A	Continuous	0.1% v/v	2.5% v/v LEL	http://www.engineeringtoolbox.com/explosive-concentration-limits-d_423.html	2.5% v/v LEL	http://www.engineeringtoolbox.com/explosive-concentration-limits-d_423.html
Ammonia	NH_3	**Toxic**	MX6 I-Brid **or** RIK Eagle 2 w/TC	N/A	Continuous	1.0 ppmv	440 µg/m^3	EPA Regional Screening Level (RSL) Summary Table April 2012, Industrial Air	1,180 µg/m^3	EPA Acute Minimal Risk Level (MRL) www.atsdr.cdc.gov/mrls/pdfs/atsdr_mrls_February_2012.pdf
Carbon Dioxide	CO_2	**Asphyxiant**	MX6 I-Brid	N/A	Continuous	0.01%	5,000 ppm, 9,000 mg/m^3	OSHA, 1910.100 Table Z-1, 8 hour TWA	30,000 ppm, 54,000 mg/m^3	ACGIH Threshold Limit Value (TLV) Short Term Exposure Limit (STEL) 15-minute TWA

Table 1
Air Sampling and Field Monitoring Methods
Air Sampling and Monitoring Data Report
Lockheed Martin Corporation

Analyte Name	Analyte Abbreviation	Reason for Measurement	Analytical Method	Media/Container	Hold Time	DL/PQL	Industrial Worker Ambient Air Screening Level		Short-Term Air Screening Level	
							Screening Level	Source for Screening Level	Screening Level	Source for Screening Level
Hydrogen Fluoride	**HF**	**Toxic**	Sensidyne Colorimetric Tube 156S with AP-20S hand pump	Colorimetric tube	Instantaneous	0.25 ppm (205 µg/m3) with 6 strokes (600 mls)	61 µg/m^3	EPA Regional Screening Level (RSL) Summary Table April 2012, Industrial Air	820 µg/m^3	Acute Exposure Guideline Level 1 (AEGL 1) (transient effects), 8-hr, http://www.epa.gov/oppt/aegl/pubs/compiled_aegls_nov072011.pdf
Hydrogen	**H_2**	**Explosive**	RKI Eagle 2 w/TC	N/A	Continuous	0.1% v/v	4.0% v/v LEL	http://www.engineeringtoolbox.com/explosive-concentration-limits-d_423.html	4.0% v/v LEL	http://www.engineeringtoolbox.com/explosive-concentration-limits-d_423.html
Hydrogen Cyanide	**HCN**	**Toxic**	MX6 I-Brid **or** RIK Eagle 2 w/TC	N/A	Continuous	0.1 ppmv	3.5 µg/m^3	EPA Regional Screening Level (RSL) Summary Table April 2012, Industrial Air	1,105 µg/m^3	Acute Exposure Guideline Level 1 (AEGL 1) (transient effects), 8-hr, http://www.epa.gov/oppt/aegl/pubs/compiled_aegls_nov072011.pdf
Hydrogen Sulfide	**H_2S**	**Toxic**	MX6 I-Brid **or** RIK Eagle 2 w/TC	N/A	Continuous	0.1 ppmv	8.8 µg/m^3	EPA Regional Screening Level (RSL) Summary Table April 2012, Industrial Air	97 µg/m^3	EPA Acute Minimal Risk Level (MRL) www.atsdr.cdc.gov/mrls/pdfs/atsdr_mrls_February_2012.pdf
Methane	**CH_4**	**Explosive**	RIK Eagle 2 w/TC	N/A	Continuous	0.1% v/v	5%v/v LEL	http://www.engineeringtoolbox.com/explosive-concentration-limits-d_423.html	5%v/v LEL	http://www.engineeringtoolbox.com/explosive-concentration-limits-d_423.html
Nitrogen	**N_2**	**Balance gas**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Oxygen	**O_2**	**Asphyxiant**	MX6 I-Brid **or** RIK Eagle 2 w/TC	N/A	Continuous	0.1% v/v	if £ 19.5% v/v	http://www.osha.gov/dte/library/respirators/major_requirements.pdf	if £ 19.5% v/v	http://www.osha.gov/dte/library/respirators/major_requirements.pdf
Phosphine	**PH_3**	**Toxic**	MX6 I-Brid **or** RIK Eagle 2 w/TC	N/A	Continuous	10 ppbv	1.3 µg/m^3	EPA Regional Screening Level (RSL) Summary Table April 2012, Industrial Air	700 µg/m^3 max for 1-hr	EPA Acute Minimal Risk Level (MRL) www.atsdr.cdc.gov/mrls/pdfs/atsdr_mrls_February_2012.pdf
On site Wind Direction		Predict Dispersion	Windsock, visual observation	N/A	N/A		N/A	N/A	N/A	N/A
On site Wind speed		Predict Dispersion	Kestrel 1000 or Dwyer wind meter	N/A	N/A		N/A	N/A	N/A	N/A
Flow		Predict Dispersion	EPA Method 2C or 2D, Laminar flow element	N/A	N/A		N/A	N/A	N/A	N/A
Lower Explosive Limit	**LEL**	**Explosive**	MX6 I-Brid **or** RIK Eagle 2 w/TC	N/A	Continuous	0.1% v/v	100%	N/A	100%	N/A

Notes:

a = All extractive sample analyses will be performed by ALS Environmental (formerly Columbia Analytical Services) Simi Valley, CA, with the exception of HCN, HF, and H_2S which will be performed by their Salt Lake City, UT laboratory.

b = CH_4, CO_2, H_2, N_2 and O_2 can be analyzed concurrently in the same sample.

Acronyms:

DL/PQL = Detection Limit / Practical Quantitation Limit

EPA = U.S. Environmental Protection Agency

mg/m^3 = milligrams per cubic meter

MRL = Method Reporting Limit

N/A = Not applicable.

NMAM = NIOSH Manual of Analytical Methods

OSHA = Occupational Safety and Health Administration

ppbv = parts per billion by volume

ppmv = parts per million by volume

TWA = Time weighted average

µg/m^3 = micrograms per cubic meter

Table 2
RCRA Landfill Field Monitoring Results
Air Sampling and Monitoring Data Report, The Dalles, Oregon
Lockheed Martin Corporation

											RKI Eagle 2 w/TC				MX6 I-Brid					Colorimetric Tube[1]
	Height/ Depth	Distance from Feature	Cardinal Direction from Feature	Additional Feature Information	Coordinates		Elevation	Date Collected	Time Collected	SL1/ SL 2[4]	LEL[2] (%)	O_2[3] (%)	CO_2 (%)	H_2S (ppm)	CH_4 (%)	HCN (ppm)	NH_3 (ppm)	PH_3 (ppm)	H_2 (ppm)	HF (ppm)
Feature Name	Feet ags	Feet			Northing	Easting	amsl				10% of LEL	19.5/ 19.5	0.5/ 3	0.0063/ 0.069	5/ 5	0.0032/ 1.005	0.63/ 1.69	0.00094/ 0.504	40,000/ 40,000	0.074/ 1.0
RCRA Fence Line Monitoring Location 1	3	-	-	Fence line	N45°37.359'	W121°12.218'	139	9/13/2012	1430		**< 0.1 ND**	20.9	0.2	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
RCRA Fence Line Monitoring Location 2	3	-	-	Fence line	N45°37.360'	W121°12.255'	133	9/13/2012	1434		**< 0.1 ND**	20.9	0.2	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
RCRA Fence Line Monitoring Location 3	3	-	-	Fence line	N45°37.347'	W121°12.298'	140	9/13/2012	1435		**< 0.1 ND**	20.9	0.2	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
RCRA Fence Line Monitoring Location 4	3	-	-	Fence line	N45°37.334'	W121°12.341'	136	9/13/2012	1438		**< 0.1 ND**	20.9	0.2	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
RCRA Fence Line Monitoring Location 5	3	-	-	Fence line	N45°37.314'	W121°12.355'	129	9/13/2012	1437		**< 0.1 ND**	20.9	0.2	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	**< 0.17 ND**
RCRA Fence Line Monitoring Location 6	3	-	-	Fence line	N45°37.282'	W121°12.335'	142	9/13/2012	1444		**< 0.1 ND**	20.9	0.2	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
RCRA Fence Line Monitoring Location 7	3	-	-	Fence line	N45°37.280'	W121°12.303'	137	9/13/2012	1445		**< 0.1 ND**	20.9	0.2	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
RCRA Fence Line Monitoring Location 8	3	-	-	Fence line	N45°37.293'	W121°12.261'	140	9/13/2012	1446		**< 0.1 ND**	20.9	0.2	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
RCRA Fence Line Monitoring Location 9	3	-	-	Fence line	N45°37.305'	W121°12.222'	141	9/13/2012	1448		**< 0.1 ND**	20.9	0.2	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
RCRA Fence Line Monitoring Location 10	3	-	-	Fence line	N45°37.326'	W121°12.197'	133	9/13/2012	1450		**< 0.1 ND**	20.9	0.2	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	1	**< 0.01 ND**	**< 1.0 ND**	NM
RCRA Utility Building	3	-	-	Garage door 1-exterior measurement	-	-	-	9/14/2012	1031		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	1	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
RCRA Utility Building	3	-	-	Utility building electrical conduit exit point-- exterior measurement	-	-	-	9/14/2012	1032		**< 0.1 ND**	20.9	0.1	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	1	**< 0.01 ND**	1	NM
RCRA Utility Building	3	-	-	Garage door 2-exterior measurement	-	-	-	9/14/2012	1033		**< 0.1 ND**	20.9	0.1	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
RCRA Utility Building	3	-	-	Main door-exterior measurement	-	-	-	9/14/2012	1034		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
RCRA Utility Building	Vent level after screen penetration	-	-	North building vent-interior measurements accessed from exterior	-	-	-	9/14/2012	1035		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	1	**< 0.01 ND**	**< 1.0 ND**	NM
RCRA Utility Building	Vent level after screen penetration	-	-	Southeast building vent-interior measurements accessed from exterior	-	-	-	9/14/2012	1040		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Cap Drain	Drain level	-	-	Cap drain 1	N45°37.336'	W121°12.220'	-	9/14/2012	1118		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	6	NM
Cap Drain	Drain level	-	-	Cap drain 2	N45°37.299'	W121°12.239'	-	9/14/2012	1123		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	11[4]	NM
Cap Drain	Drain level	-	-	Cap drain 3	N45°37.284'	W121°12.288'	-	9/14/2012	1126		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	6	NM
Cap Drain	Drain level	-	-	Cap drain 4	N45°37.299'	W121°12.344'	-	9/14/2012	1129		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	5	**< 0.17 ND**

Table 2
RCRA Landfill Field Monitoring Results
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Lockheed Martin Corporation

											RKI Eagle 2 w/TC				MX6 I-Brid					Colorimetric Tube[1]
	Height/ Depth	Distance from Feature	Cardinal Direction from Feature	Additional Feature Information	Coordinates		Elevation	Date Collected	Time Collected	SL1/ SL 2[4]	LEL[2] (%)	O_2[3] (%)	CO_2 (%)	H_2S (ppm)	CH_4 (%)	HCN (ppm)	NH_3 (ppm)	PH_3 (ppm)	H_2 (ppm)	HF (ppm)
Feature Name	Feet ags	Feet			Northing	Easting	amsl				10% of LEL	19.5/ 19.5	0.5/ 3	0.0063/ 0.069	5/ 5	0.0032/ 1.005	0.63/ 1.69	0.00094/ 0.504	40,000/ 40,000	0.074/ 1.0
Cap Drain	Drain level	-	-	Cap drain 5	N45°37.339'	W121°12.322'	-	9/14/2012	1132		**< 0.1 ND**	20.9	0.1	**< 0.5 ND**	**< 1.0 ND**	0.1	**< 1.0 ND**	**< 0.01 ND**	3	NM
Cap Drain	Drain level	-	-	Cap drain 5 re-checked[5]	N45°37.339'	W121°12.322'	-	9/14/2012	1148		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	**< 0.17 ND**
Cap Drain	Drain level	-	-	Cap drain 6	N45°37.350'	W121°12.269'	-	9/14/2012	1146		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Sump	-1.5	-	-	Center of the sump at a depth of 1.5 feet	N45°37.350'	W121°12.207'	-	9/14/2012	1212		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	5	**< 0.17 ND**
Sump	1	1	N	-	N45°37.350'	W121°12.207'	-	9/14/2012	1212 - 1305		**< 0.1 ND**	20.9	0.1	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	**< 0.17 ND**
Sump	1	1	E	-	N45°37.350'	W121°12.207'	-	9/14/2012	1212 - 1305		**< 0.1 ND**	20.9	0.1	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Sump	1	1	S	-	N45°37.350'	W121°12.207'	-	9/14/2012	1212 - 1305		**< 0.1 ND**	20.9	0.1	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Sump	1	1	W	-	N45°37.350'	W121°12.207'	-	9/14/2012	1212 - 1305		**< 0.1 ND**	20.9	0.1	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Sump	5	2	N	-	N45°37.350'	W121°12.207'	-	9/14/2012	1212 - 1305		**< 0.1 ND**	20.9	0.1	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	1	NM
Sump	5	2	E	-	N45°37.350'	W121°12.207'	-	9/14/2012	1212 - 1305		**< 0.1 ND**	20.9	0.1	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Sump	5	2	S	Not conducted: wall created space limitations	N45°37.350'	W121°12.207'	-	9/14/2012	-		NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
Sump	5	2	W	Not conducted: wall created space limitations	N45°37.350'	W121°12.207'	-	9/14/2012	-		NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
Sump	5	5	N	Not conducted: wall created space limitations	N45°37.350'	W121°12.207'	-	9/14/2012	-		NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
Sump	5	5	E	Not conducted: wall created space limitations	N45°37.350'	W121°12.207'	-	9/14/2012	-		NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
Sump	5	5	S	Not conducted: wall created space limitations	N45°37.350'	W121°12.207'	-	9/14/2012	-		NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
Sump	5	5	W	Not conducted: wall created space limitations	N45°37.350'	W121°12.207'	-	9/14/2012	-		NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
Vent 1	3	20	-	-	-	-	-	9/14/2012	1252 - 1330		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Vent 1	3	15	-	-	-	-	-	9/14/2012	1252 - 1330		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Vent 1	3	10	-	-	-	-	-	9/14/2012	1252 - 1330		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Vent 1	3	5	-	-	-	-	-	9/14/2012	1252 - 1330		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM

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											RKI Eagle 2 w/TC				MX6 I-Brid					Colorimetric Tube[1]
	Height/ Depth	Distance from Feature	Cardinal Direction from Feature	Additional Feature Information	Coordinates		Elevation	Date Collected	Time Collected	SL1/ SL 2[4]	LEL[2] (%)	O_2[3] (%)	CO_2 (%)	H_2S (ppm)	CH_4 (%)	HCN (ppm)	NH_3 (ppm)	PH_3 (ppm)	H_2 (ppm)	HF (ppm)
Feature Name	Feet ags	Feet			Northing	Easting	amsl				10% of LEL	19.5/ 19.5	0.5/ 3	0.0063/ 0.069	5/ 5	0.0032/ 1.005	0.63/ 1.69	0.00094/ 0.504	40,000/ 40,000	0.074/ 1.0
Vent 1	3	2	-	-	-	-	-	9/14/2012	1252 - 1330		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Vent 1	5	5	N	-	-	-	-	9/14/2012	1252 - 1330		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Vent 1	5	5	E	-	-	-	-	9/14/2012	1252 - 1330		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Vent 1	5	5	S	-	-	-	-	9/14/2012	1252 - 1330		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Vent 1	5	5	W	-	-	-	-	9/14/2012	1252 - 1330		**< 0.1 ND**	20.9	0.1	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Vent 1	5	2	N	-	-	-	-	9/14/2012	1252 - 1330		**< 0.1 ND**	20.9	0.1	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Vent 1	5	2	E	-	-	-	-	9/14/2012	1252 - 1330		**< 0.1 ND**	20.9	0.1	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Vent 1	5	2	S	-	-	-	-	9/14/2012	1252 - 1330		**< 0.1 ND**	20.9	0.1	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Vent 1	5	2	W	-	-	-	-	9/14/2012	1252 - 1330		**< 0.1 ND**	20.9	0.1	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Vent 1	1	1	N	-	-	-	-	9/14/2012	1252 - 1330		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	10 and 0[3]	**< 0.17 ND**
Vent 1	1	1	E	-	-	-	-	9/14/2012	1252 - 1330		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	10 and 4[3]	NM
Vent 1	1	1	S	-	-	-	-	9/14/2012	1252 - 1330		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	10 and 5[3]	NM
Vent 1	1	1	W	-	-	-	-	9/14/2012	1252 - 1330		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	10 and 0[3]	NM
Vent 2	3	20	-	-	-	-	-	9/14/2012	1252 - 1330		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Vent 2	3	15	-	-	-	-	-	9/14/2012	1252 - 1330		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	20	NM
Vent 2	3	10	-	-	-	-	-	9/14/2012	1252 - 1330		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Vent 2	3	5	-	-	-	-	-	9/14/2012	1252 - 1330		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	20	NM
Vent 2	3	2	-	-	-	-	-	9/14/2012	1252 - 1330		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	20	NM
Vent 2	5	5	N	-	-	-	-	9/14/2012	1252 - 1330		**< 0.1 ND**	20.9	0.1	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Vent 2	5	5	E	-	-	-	-	9/14/2012	1252 - 1330		**< 0.1 ND**	20.9	0.1	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM

Table 2
RCRA Landfill Field Monitoring Results
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Lockheed Martin Corporation

Feature Name	Height/ Depth	Distance from Feature	Cardinal Direction from Feature	Additional Feature Information	Coordinates		Elevation	Date Collected	Time Collected	SL1/ SL 2[4]	RKI Eagle 2 w/TC				MX6 I-Brid					Colorimetric Tube[1]
											LEL[2] (%)	O_2[3] (%)	CO_2 (%)	H_2S (ppm)	CH_4 (%)	HCN (ppm)	NH_3 (ppm)	PH_3 (ppm)	H_2 (ppm)	HF (ppm)
	Feet ags	Feet			Northing	Easting	amsl				10% of LEL	19.5/ 19.5	0.5/ 3	0.0063/ 0.069	5/ 5	0.0032/ 1.005	0.63/ 1.69	0.00094/ 0.504	40,000/ 40,000	0.074/ 1.0
Vent 2	5	5	S	-	-	-	-	9/14/2012	1252 - 1330		< 0.1 ND	20.9	0.1	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Vent 2	5	5	W	-	-	-	-	9/14/2012	1252 - 1330		< 0.1 ND	20.9	0.1	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Vent 2	5	2	N	-	-	-	-	9/14/2012	1252 - 1330		< 0.1 ND	20.9	0.1	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Vent 2	5	2	E	-	-	-	-	9/14/2012	1252 - 1330		< 0.1 ND	20.9	0.1	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Vent 2	5	2	S	-	-	-	-	9/14/2012	1252 - 1330		< 0.1 ND	20.9	0.1	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Vent 2	5	2	W	-	-	-	-	9/14/2012	1252 - 1330		< 0.1 ND	20.9	0.1	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Vent 2	1	1	N	-	-	-	-	9/14/2012	1252 - 1330		< 0.1 ND	20.9	0.1	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	20 and 52[3]	NM
Vent 2	1	1	E	-	-	-	-	9/14/2012	1252 - 1330		< 0.1 ND	20.9	0.1	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	0 and 0[3]	NM
Vent 2	1	1	S	-	-	-	-	9/14/2012	1252 - 1330		< 0.1 ND	20.9	0.1	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	0 and 0[3]	NM
Vent 2	1	1	W	-	-	-	-	9/14/2012	1252 - 1330		< 0.1 ND	20.9	0.1	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	20 and 0[3]	< 0.17 ND
Vent 3	3	20	-	-	-	-	-	9/14/2012	1252 - 1330		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Vent 3	3	15	-	-	-	-	-	9/14/2012	1252 - 1330		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	1	NM
Vent 3	3	10	-	-	-	-	-	9/14/2012	1252 - 1330		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Vent 3	3	5	-	-	-	-	-	9/14/2012	1252 - 1330		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Vent 3	3	2	-	-	-	-	-	9/14/2012	1252 - 1330		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Vent 3	5	5	N	-	-	-	-	9/14/2012	1252 - 1330		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Vent 3	5	5	E	-	-	-	-	9/14/2012	1252 - 1330		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Vent 3	5	5	S	-	-	-	-	9/14/2012	1252 - 1330		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Vent 3	5	5	W	-	-	-	-	9/14/2012	1252 - 1330		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Vent 3	5	2	N	-	-	-	-	9/14/2012	1252 - 1330		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM

Table 2
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Lockheed Martin Corporation

											RKI Eagle 2 w/TC				MX6 I-Brid					Colorimetric Tube[1]
	Height/ Depth	Distance from Feature	Cardinal Direction from Feature	Additional Feature Information	Coordinates		Elevation	Date Collected	Time Collected	SL1/ SL 2[4]	LEL[2] (%)	O_2[3] (%)	CO_2 (%)	H_2S (ppm)	CH_4 (%)	HCN (ppm)	NH_3 (ppm)	PH_3 (ppm)	H_2 (ppm)	HF (ppm)
Feature Name	Feet ags	Feet			Northing	Easting	amsl				10% of LEL	19.5/ 19.5	0.5/ 3	0.0063/ 0.069	5/ 5	0.0032/ 1.005	0.63/ 1.69	0.00094/ 0.504	40,000/ 40,000	0.074/ 1.0
Vent 3	5	2	E	-	-	-	-	9/14/2012	1252 - 1330		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	22	NM
Vent 3	5	2	S	-	-	-	-	9/14/2012	1252 - 1330		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Vent 3	5	2	W	-	-	-	-	9/14/2012	1252 - 1330		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	3	NM
Vent 3	1	1	N	-	-	-	-	9/14/2012	1252 - 1330		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	< 0.17 ND
Vent 3	1	1	E	-	-	-	-	9/14/2012	1252 - 1330		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	< 0.17 ND
Vent 3	1	1	S	-	-	-	-	9/14/2012	1252 - 1330		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	< 0.17 ND
Vent 3	1	1	W	-	-	-	-	9/14/2012	1252 - 1330		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	< 0.17 ND

Notes:

LEL (Detection limit DL=0.1 %), CH_4 Methane (DL=1.0%), O_2 Oxygen (DL=0.1%), CO_2 Carbon dioxide (DL=0.1%), Hydrogen sulfide H_2S (DL=0.5 ppm), Ammonia NH_3 (DL=1.0ppm), Phosphine PH_3 (DL=0.01ppm), Hydrogen H_2 (DL=1.0 ppm), Hydrogen fluoride HF (DL=0.17 ppm)

[1] Sensidyne colorimetric tube 156S with AP-20S hand pum

[2] % lower explosive limit (LEL) calibrated as CH_4. Acetylene screening measurements were made as part of the LEL measurements since no separate detector was available for acetylene. LEL observed will be a function of methane, acetylene, hydroge and all other flammable gasses that may be present.

[3] Field readings for O_2 were recorded in the field logbooks as "0", or normal, to expedite recordation. The normal value is 20.

[4] SL1/SL2 = Screening Level 1/Screening Level 2; SL1 used for Industrial Worker Ambient Air Screening Levels, SL2 used for Short-Term Air Screening Lev

[5] Team cleared area, re-zeroed instruments, and came back to re-check readings.

BOLD < with **ND** indicates less than the DL as specified by the instrument manufactures manua

Acronyms:
ags = above ground surface
amsl = above mean sea level
NM = Not measured
% = percent
ppm = parts per million
RCRA = Resource Conservation and Recovery Act

Table 2
RCRA Landfill Field Monitoring Results
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Feature Name	Height/ Depth	Distance from Feature	Cardinal Direction from Feature	Additional Feature Information	Coordinates		Elevation	Date Collected	Time Collected	SL1/ SL 2[4]	RKI Eagle 2 w/TC				MX6 I-Brid					Colorimetric Tube[1]
											LEL[2] (%)	O_2[3] (%)	CO_2 (%)	H_2S (ppm)	CH_4 (%)	HCN (ppm)	NH_3 (ppm)	PH_3 (ppm)	H_2 (ppm)	HF (ppm)
	Feet ags	Feet			Northing	Easting	amsl				10% of LEL	19.5/ 19.5	0.5/ 3	0.0063/ 0.069	5/ 5	0.0032/ 1.005	0.63/ 1.69	0.00094/ 0.504	40,000/ 40,000	0.074/ 1.0
DATA ASSOCIATED WITH LANDFILL EMISSION FLOW RATE AND SHIPPING DETERMINATION																				
Vent 2	-	-	-	Outlet-zero flow detected from vent, (<10 ccm by rotometer)	-	-	-	**9/15/2012**	1000		**< 0.1 ND**	NM	NM	NM	NM	NM	NM	NM	NM	NM
Vent 2	-	-	-	Measurement taken for shipping determination (vent sampling tube)	-	-	-	9/15/2012	1005		NM	NM	NM	NM	NM	0.4	252	> 10	> 1000	NM
Vent 2	-	-	-	Outlet-zero flow detected in or out of vent (< 10 ccm by rotometer)	-	-	-	**9/16/2012**	1005		NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
Vent 2	-	-	-	Outlet-zero flow detected in or out of vent (< 10 ccm by rotometer)	-	-	-	**9/16/2012**	1724		NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
Vent 2	-	-	-	Attached tedlar bag to outlet to capture gas evolution over time	-	-	-	**9/16/2012**	1732		NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
Vent 2	-	-	-	Measured volume of gas contained in tedlar bag deployed on 9/16/2012[5]	-	-	-	**9/18/2012**	1000		NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
Vent 2	-	-	-	Test using 20:1 dilution of tedlar bag sample [6]	-	-	-	9/18/2012	1120 - 1730		LEL 160%	NM	NM	100	LEL 160%	440	2240	5.2	> 20000	NM

[5] Measured gas in tedlar bag deployed on 9/16/2012 and removed 9/18/12. Depolyed at 175 cc using 50 ml Sensidyne sampling pump (gas evolution rate of ~4.3 cc/hour or 103 ml/day)

[6] Attached evacuated tedlar bag to vent and pulled 200 ml of sample using a personal sampling pump used for extractive sampling (1 to 5 liters per minute flow rate). A rotometer was used to dilute the sample using a 20 to 1 ratio of zero grade N2 gas to sample. The monitoring instruments were serially attached to the tedlar bag during measurement of the diluted sample.

Table 3
CERCLA Landfill Field Monitoring Results
Air Sampling and Monitoring Data Report, The Dalles, Oregon
Lockheed Martin Corporation

Feature Name	Height/ Depth	Distance from Feature	Cardinal Direction from Feature	Additional Feature Information	Coordinates		Elevation	Date Collected	Time Collected	SL1/ SL 2[4]	RKI Eagle 2 w/TC				MX6 I-Brid					Colorimetric Tube[1]
											LEL[2] (%)	O_2[3] (%)	CO_2 (%)	H_2S (ppm)	CH_4 (%)	HCN (ppm)	NH_3 (ppm)	PH_3 (ppm)	H_2 (ppm)	HF (ppm)
	Feet ags	Feet			Northing	Easting	amsl				10% of LEL	19.5/ 19.5	0.5/ 3	0.0063/ 0.069	5/ 5	0.0032/ 1.005	0.63/ 1.69	0.00094/ 0.504	4/ 4	0.074/ 1.0
CERCLA Fence Line Monitoring Location 1	3	-	-	Fence line	N45°37.586'	W121°12.276'	136	9/13/2012	1325		< 0.1 ND	20.9	0.2	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
CERCLA Fence Line Monitoring Location 2	3	-	-	Fence line	N45°37.603'	W121°12.227'	139	9/13/2012	1330		< 0.1 ND	20.9	0.2	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
CERCLA Fence Line Monitoring Location 3	3	-	-	Fence line	N45°37.613'	W121°12.185'	132	9/13/2012	1335		< 0.1 ND	20.9	0.2	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
CERCLA Fence Line Monitoring Location 4	3	-	-	Fence line	N45°37.643'	W121°12.192'	123	9/13/2012	1337		< 0.1 ND	20.9	0.2	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
CERCLA Fence Line Monitoring Location 5	3	-	-	Fence line	N45°37.670'	W121°12.208'	127	9/13/2012	1340		< 0.1 ND	20.9	0.2	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
CERCLA Fence Line Monitoring Location 6	3	-	-	Fence line	N45°37.700'	W121°12.231'	131	9/13/2012	1343		< 0.1 ND	20.9	0.2	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
CERCLA Fence Line Monitoring Location 7	3	-	-	Fence line	N45°37.728'	W121°12.258'	132	9/13/2012	1345		< 0.1 ND	20.9	0.2	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
CERCLA Fence Line Monitoring Location 8	3	-	-	Fence line	N45°37.755'	W121°12.287'	141	9/13/2012	1346		< 0.1 ND	20.9	0.2	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
CERCLA Fence Line Monitoring Location 9	3	-	-	Fence line	N45°37.777'	W121°12.323'	141	9/13/2012	1348		< 0.1 ND	20.9	0.2	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
CERCLA Fence Line Monitoring Location 10	3	-	-	Fence line	N45°37.786'	W121°12.368'	140	9/13/2012	1349		< 0.1 ND	20.9	0.2	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	< 0.17 ND
CERCLA Fence Line Monitoring Location 11	3	-	-	Fence line	N45°37.766'	W121°12.399'	136	9/13/2012	1357		< 0.1 ND	20.9	0.2	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
CERCLA Fence Line Monitoring Location 12	3	-	-	Fence line	N45°37.736'	W121°12.413'	144	9/13/2012	1359		< 0.1 ND	20.9	0.2	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
CERCLA Fence Line Monitoring Location 13	3	-	-	Fence line	N45°37.703'	W121°12.431'	142	9/13/2012	1400		< 0.1 ND	20.9	0.2	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
CERCLA Fence Line Monitoring Location 14	3	-	-	Fence line	N45°37.676'	W121°12.454'	142	9/13/2012	1401		< 0.1 ND	20.9	0.2	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
CERCLA Fence Line Monitoring Location 15	3	-	-	Fence line	N45°37.645'	W121°12.468'	137	9/13/2012	1402		< 0.1 ND	20.9	0.2	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
CERCLA Fence Line Monitoring Location 16	3	-	-	Fence line	N45°37.621'	W121°12.444'	130	9/13/2012	1404		< 0.1 ND	20.9	0.2	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	< 0.17 ND
CERCLA Fence Line Monitoring Location 17	3	-	-	Fence line	N45°37.625'	W121°12.398'	136	9/13/2012	1405		< 0.1 ND	20.9	0.2	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
CERCLA Fence Line Monitoring Location 18	3	-	-	Fence line	N45°37.627'	W121°12.352'	123	9/13/2012	1406		< 0.1 ND	20.9	0.2	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM

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Feature Name	Height/ Depth	Distance from Feature	Cardinal Direction from Feature	Additional Feature Information	Coordinates		Elevation	Date Collected	Time Collected	SL1/ SL 2[4]	RKI Eagle 2 w/TC				MX6 I-Brid					Colorimetric Tube[1]
											LEL[2] (%)	O_2[3] (%)	CO_2 (%)	H_2S (ppm)	CH_4 (%)	HCN (ppm)	NH_3 (ppm)	PH_3 (ppm)	H_2 (ppm)	HF (ppm)
	Feet ags	Feet			Northing	Easting	amsl				10% of LEL	19.5/ 19.5	0.5/ 3	0.0063/ 0.069	5/ 5	0.0032/ 1.005	0.63/ 1.69	0.00094/ 0.504	4/ 4	0.074/ 1.0
CERCLA Fence Line Monitoring Location 19	3	-	-	Fence line	N45°37.619'	W121°12.306'	134	9/13/2012	1408		< 0.1 ND	20.9	0.2	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Lift Station 1	3	20	-	Approached the 20 feet limit from the West	N45°37.668'	W121°12.227'	142	9/17/2012	1417		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	Standard signal ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Lift Station 1	3	15	-	-	N45°37.668'	W121°12.227'	-	9/17/2012	1417 -1428		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	Standard signal ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Lift Station 1	3	10	-	-	N45°37.668'	W121°12.227'	-	9/17/2012	1417 - 1428		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	Standard signal ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Lift Station 1	3	5	-	-	N45°37.668'	W121°12.227'	-	9/17/2012	1417 - 1428		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	Standard signal ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Lift Station 1	3	2	-	-	N45°37.668'	W121°12.227'	-	9/17/2012	1417 - 1428		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	Standard signal ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Lift Station 1	5	5	N	-	N45°37.668'	W121°12.227'	-	9/17/2012	1417 - 1428		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Lift Station 1	5	5	E	-	N45°37.668'	W121°12.227'	-	9/17/2012	1417 - 1428		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Lift Station 1	5	5	S	-	N45°37.668'	W121°12.227'	-	9/17/2012	1417 - 1428		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Lift Station 1	5	5	W	-	N45°37.668'	W121°12.227'	-	9/17/2012	1417 - 1428		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Lift Station 1	5	2	N	-	N45°37.668'	W121°12.227'	-	9/17/2012	1417 - 1428		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Lift Station 1	5	2	E	-	N45°37.668'	W121°12.227'	-	9/17/2012	1417 - 1428		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Lift Station 1	5	2	S	-	N45°37.668'	W121°12.227'	-	9/17/2012	1417 - 1428		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Lift Station 1	5	2	W	-	N45°37.668'	W121°12.227'	-	9/17/2012	1417 - 1428		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Lift Station 1	1	1	N	-	N45°37.668'	W121°12.227'	-	9/17/2012	1417 - 1428		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Lift Station 1	1	1	E	-	N45°37.668'	W121°12.227'	-	9/17/2012	1417 - 1428		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Lift Station 1	1	1	S	-	N45°37.668'	W121°12.227'	-	9/17/2012	1417 - 1428		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM
Lift Station 1	1	1	W	-	N45°37.668'	W121°12.227'	-	9/17/2012	1417 - 1428		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	< 1.0 ND	NM

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Feature Name	Height/ Depth	Distance from Feature	Cardinal Direction from Feature	Additional Feature Information	Coordinates		Elevation	Date Collected	Time Collected	SL1/ SL 2[4]	RKI Eagle 2 w/TC				MX6 I-Brid					Colorimetric Tube[1]
											LEL[2] (%)	O_2[3] (%)	CO_2 (%)	H_2S (ppm)	CH_4 (%)	HCN (ppm)	NH_3 (ppm)	PH_3 (ppm)	H_2 (ppm)	HF (ppm)
	Feet ags	Feet			Northing	Easting	amsl				10% of LEL	19.5/ 19.5	0.5/ 3	0.0063/ 0.069	5/ 5	0.0032/ 1.005	0.63/ 1.69	0.00094/ 0.504	4/ 4	0.074/ 1.0
Lift Station 2	3	20	-	Approached the 20 feet limit from the West	N45°37.633'	W121°12.323'	136	9/17/2012	1428		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Lift Station 2	3	15	-	-	N45°37.633'	W121°12.323'	-	9/17/2012	1428 - 1436		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Lift Station 2	3	10	-	-	N45°37.633'	W121°12.323'	-	9/17/2012	1428 - 1436		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Lift Station 2	3	5	-	-	N45°37.633'	W121°12.323'	-	9/17/2012	1428 - 1436		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Lift Station 2	3	2	-	-	N45°37.633'	W121°12.323'	-	9/17/2012	1428 - 1436		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Lift Station 2	1	1	N	-	N45°37.633'	W121°12.323'	-	9/17/2012	1428 - 1436		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Lift Station 2	1	1	E	-	N45°37.633'	W121°12.323'	-	9/17/2012	1428 - 1436		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Lift Station 2	1	1	S	-	N45°37.633'	W121°12.323'	-	9/17/2012	1428 - 1436		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Lift Station 2	1	1	W	-	N45°37.633'	W121°12.323'	-	9/17/2012	1428 - 1436		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Lift Station 2	5	2	N	-	N45°37.633'	W121°12.323'	-	9/17/2012	1428 - 1436		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Lift Station 2	5	2	E	-	N45°37.633'	W121°12.323'	-	9/17/2012	1428 - 1436		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Lift Station 2	5	2	S	-	N45°37.633'	W121°12.323'	-	9/17/2012	1428 - 1436		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Lift Station 2	5	2	W	-	N45°37.633'	W121°12.323'	-	9/17/2012	1428 - 1436		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Lift Station 2	5	5	N	-	N45°37.633'	W121°12.323'	-	9/17/2012	1428 - 1436		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Lift Station 2	5	5	E	-	N45°37.633'	W121°12.323'	-	9/17/2012	1428 - 1436		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Lift Station 2	5	5	S	-	N45°37.633'	W121°12.323'	-	9/17/2012	1428 - 1436		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Lift Station 2	5	5	W	-	N45°37.633'	W121°12.323'	-	9/17/2012	1436 Done		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Manhole 1	3	20	-	Approached the 20 feet limit from the West	N45°37.757'	W121°12.322'	144	9/17/2012	1518		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**Standard signal ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	2	NM

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Feature Name	Height/ Depth	Distance from Feature	Cardinal Direction from Feature	Additional Feature Information	Coordinates		Elevation	Date Collected	Time Collected	SL1/ SL 2[4]	RKI Eagle 2 w/TC				MX6 I-Brid					Colorimetric Tube[1]
											LEL[2] (%)	O_2[3] (%)	CO_2 (%)	H_2S (ppm)	CH_4 (%)	HCN (ppm)	NH_3 (ppm)	PH_3 (ppm)	H_2 (ppm)	HF (ppm)
	Feet ags	Feet			Northing	Easting	amsl				10% of LEL	19.5/ 19.5	0.5/ 3	0.0063/ 0.069	5/ 5	0.0032/ 1.005	0.63/ 1.69	0.00094/ 0.504	4/ 4	0.074/ 1.0
Manhole 1	3	15	-	-	N45°37.757'	W121°12.322'	-	9/17/2012	1518 - 1528		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	Standard signal ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	5	NM
Manhole 1	3	10	-	-	N45°37.757'	W121°12.322'	-	9/17/2012	1518 - 1528		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	Standard signal ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	3	NM
Manhole 1	3	5	-	-	N45°37.757'	W121°12.322'	-	9/17/2012	1518 - 1528		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	Standard signal ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	2	NM
Manhole 1	3	2	-	-	N45°37.757'	W121°12.322'	-	9/17/2012	1518 - 1528		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	Standard signal ND	Standard signal ND	Standard signal ND	Standard signal ND	Standard signal ND	NM
Manhole 1	5	5	N	-	N45°37.757'	W121°12.322'	-	9/17/2012	1518 - 1528		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	6	NM
Manhole 1	5	5	E	-	N45°37.757'	W121°12.322'	-	9/17/2012	1518 - 1528		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	7	NM
Manhole 1	5	5	S	-	N45°37.757'	W121°12.322'	-	9/17/2012	1518 - 1528		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	9	NM
Manhole 1	5	5	W	-	N45°37.757'	W121°12.322'	-	9/17/2012	1518 - 1528		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	6	NM
Manhole 1	5	2	N	-	N45°37.757'	W121°12.322'	-	9/17/2012	1518 - 1528		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	6	NM
Manhole 1	5	2	E	-	N45°37.757'	W121°12.322'	-	9/17/2012	1518 - 1528		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	5	NM
Manhole 1	5	2	S	-	N45°37.757'	W121°12.322'	-	9/17/2012	1518 - 1528		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	5	NM
Manhole 1	5	2	W	-	N45°37.757'	W121°12.322'	-	9/17/2012	1518 - 1528		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	4	NM
Manhole 1	1	1	N	-	N45°37.757'	W121°12.322'	-	9/17/2012	1518 - 1528		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	6	NM
Manhole 1	1	1	E	-	N45°37.757'	W121°12.322'	-	9/17/2012	1518 - 1528		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	7	NM
Manhole 1	1	1	S	-	N45°37.757'	W121°12.322'	-	9/17/2012	1518 - 1528		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	7	NM
Manhole 1	1	1	W	-	N45°37.757'	W121°12.322'	-	9/17/2012	1518 - 1528		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	4	NM
Manhole 2	3	20	-	-	N45°37.717'	W121°12.338'	146	9/17/2012	1535		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	Standard signal ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	3	NM
Manhole 2	3	15	-	-	N45°37.717'	W121°12.338'	-	9/17/2012	1535 - 1539		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	Standard signal ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	10	NM

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											LEL[2] (%)	O_2[3] (%)	CO_2 (%)	H_2S (ppm)	CH_4 (%)	HCN (ppm)	NH_3 (ppm)	PH_3 (ppm)	H_2 (ppm)	HF (ppm)
	Feet ags	Feet			Northing	Easting	amsl				10% of LEL	19.5/ 19.5	0.5/ 3	0.0063/ 0.069	5/ 5	0.0032/ 1.005	0.63/ 1.69	0.00094/ 0.504	4/ 4	0.074/ 1.0
Manhole 2	3	10	-	-	N45°37.717'	W121°12.338'	-	9/17/2012	1535 - 1539		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	Standard signal ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	9	NM
Manhole 2	3	5	-	-	N45°37.717'	W121°12.338'	-	9/17/2012	1535 - 1539		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	Standard signal ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	9	NM
Manhole 2	3	2	-	-	N45°37.717'	W121°12.338'	-	9/17/2012	1535 - 1539		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	Standard signal ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	Standard signal ND	NM
Manhole 2	5	5	N	-	N45°37.717'	W121°12.338'	-	9/17/2012	1535 - 1539		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	10	NM
Manhole 2	5	5	E	-	N45°37.717'	W121°12.338'	-	9/17/2012	1535 - 1539		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	9	NM
Manhole 2	5	5	S	-	N45°37.717'	W121°12.338'	-	9/17/2012	1535 - 1539		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	8	NM
Manhole 2	5	5	W	-	N45°37.717'	W121°12.338'	-	9/17/2012	1535 - 1539		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	10	NM
Manhole 2	5	2	N	-	N45°37.717'	W121°12.338'	-	9/17/2012	1535 - 1539		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	10	NM
Manhole 2	5	2	E	-	N45°37.717'	W121°12.338'	-	9/17/2012	1535 - 1539		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	10	NM
Manhole 2	5	2	S	-	N45°37.717'	W121°12.338'	-	9/17/2012	1535 - 1539		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	10	NM
Manhole 2	5	2	W	-	N45°37.717'	W121°12.338'	-	9/17/2012	1535 - 1539		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	7	NM
Manhole 2	1	1	N	-	N45°37.717'	W121°12.338'	-	9/17/2012	1535 - 1539		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	9	NM
Manhole 2	1	1	E	-	N45°37.717'	W121°12.338'	-	9/17/2012	1535 - 1539		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	10	NM
Manhole 2	1	1	S	-	N45°37.717'	W121°12.338'	-	9/17/2012	1535 - 1539		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	10	NM
Manhole 2	1	1	W	-	N45°37.717'	W121°12.338'	-	9/17/2012	1539-Done		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	9	NM
Manhole 3	3	20	-	-	N45°37.722'	W121°12.281'	120	9/17/2012	1544		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	Standard signal ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	7	NM
Manhole 3	3	15	-	-	N45°37.722'	W121°12.281'	-	9/17/2012	1544 - 1550		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	Standard signal ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	7	NM
Manhole 3	3	10	-	-	N45°37.722'	W121°12.281'	-	9/17/2012	1544 - 1550		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	Standard signal ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	7	NM

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Feature Name	Height/ Depth	Distance from Feature	Cardinal Direction from Feature	Additional Feature Information	Coordinates		Elevation	Date Collected	Time Collected		RKI Eagle 2 w/TC				MX6 I-Brid					Colorimetric Tube[1]
											LEL[2] (%)	O_2[3] (%)	CO_2 (%)	H_2S (ppm)	CH_4 (%)	HCN (ppm)	NH_3 (ppm)	PH_3 (ppm)	H_2 (ppm)	HF (ppm)
	Feet ags	Feet			Northing	Easting	amsl			SL1/ SL 2[4]	10% of LEL	19.5/ 19.5	0.5/ 3	0.0063/ 0.069	5/ 5	0.0032/ 1.005	0.63/ 1.69	0.00094/ 0.504	4/ 4	0.074/ 1.0
Manhole 3	3	5	-	-	N45°37.722'	W121°12.281'	-	9/17/2012	1544 - 1550		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	Standard signal ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	7	NM
Manhole 3	3	2	-	-	N45°37.722'	W121°12.281'	-	9/17/2012	1544 - 1550		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	Standard signal ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	7	NM
Manhole 3	5	5	N	-	N45°37.722'	W121°12.281'	-	9/17/2012	1544 - 1550		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	6	NM
Manhole 3	5	5	E	-	N45°37.722'	W121°12.281'	-	9/17/2012	1544 - 1550		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	7	NM
Manhole 3	5	5	S	-	N45°37.722'	W121°12.281'	-	9/17/2012	1544 - 1550		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	6	NM
Manhole 3	5	5	W	-	N45°37.722'	W121°12.281'	-	9/17/2012	1544 - 1550		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	7	NM
Manhole 3	5	2	N	-	N45°37.722'	W121°12.281'	-	9/17/2012	1544 - 1550		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	6	NM
Manhole 3	5	2	E	-	N45°37.722'	W121°12.281'	-	9/17/2012	1544 - 1550		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	6	NM
Manhole 3	5	2	S	-	N45°37.722'	W121°12.281'	-	9/17/2012	1544 - 1550		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	6	NM
Manhole 3	5	2	W	-	N45°37.722'	W121°12.281'	-	9/17/2012	1544 - 1550		< 0.1 ND	20.9	< 0.02 ND	< 0.5 ND	< 1.0 ND	< 0.1 ND	< 1.0 ND	< 0.01 ND	7	NM

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Feature Name	Height/ Depth	Distance from Feature	Cardinal Direction from Feature	Additional Feature Information	Coordinates		Elevation	Date Collected	Time Collected	SL1/ SL 2[4]	RKI Eagle 2 w/TC				MX6 I-Brid					Colorimetric Tube[1]
											LEL[2] (%)	O_2[3] (%)	CO_2 (%)	H_2S (ppm)	CH_4 (%)	HCN (ppm)	NH_3 (ppm)	PH_3 (ppm)	H_2 (ppm)	HF (ppm)
	Feet ags	Feet			Northing	Easting	amsl				10% of LEL	19.5/ 19.5	0.5/ 3	0.0063/ 0.069	5/ 5	0.0032/ 1.005	0.63/ 1.69	0.00094/ 0.504	4/ 4	0.074/ 1.0
Manhole 3	1	1	N	Not conducted: 1 foot height was the same as the 5 foot height due to steep nearby slope	N45°37.722'	W121°12.281'	-	9/17/2012	1544 - 1550		NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
Manhole 3	1	1	E		N45°37.722'	W121°12.281'	-	9/17/2012	1544 - 1550		NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
Manhole 3	1	1	S		N45°37.722'	W121°12.281'	-	9/17/2012	1544 - 1550		NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
Manhole 3	1	1	W		N45°37.722'	W121°12.281'	-	9/17/2012	1544 - 1550		NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
Manhole 4	3	20	-		N45°37.637'	W121°12.398'	134	9/17/2012	1439		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Manhole 4	3	15	-	-	N45°37.637'	W121°12.398'	-	9/17/2012	1439 - 1445		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Manhole 4	3	10	-	-	N45°37.637'	W121°12.398'	-	9/17/2012	1439 - 1445		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Manhole 4	3	5	-	-	N45°37.637'	W121°12.398'	-	9/17/2012	1439 - 1445		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Manhole 4	3	2	-	-	N45°37.637'	W121°12.398'	-	9/17/2012	1439 - 1445		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Manhole 4	1	1	N	-	N45°37.637'	W121°12.398'	-	9/17/2012	1439 - 1445		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Manhole 4	1	1	E	-	N45°37.637'	W121°12.398'	-	9/17/2012	1439 - 1445		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Manhole 4	1	1	S	-	N45°37.637'	W121°12.398'	-	9/17/2012	1439 - 1445		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Manhole 4	1	1	W	-	N45°37.637'	W121°12.398'	-	9/17/2012	1439 - 1445		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Manhole 4	5	2	N	-	N45°37.637'	W121°12.398'	-	9/17/2012	1439 - 1445		**< 0.1 ND**	20.9	**Standard signal ND**	**Standard signal ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Manhole 4	5	2	E	-	N45°37.637'	W121°12.398'	-	9/17/2012	1439 - 1445		**< 0.1 ND**	20.9	**Standard signal ND**	**Standard signal ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Manhole 4	5	2	S	-	N45°37.637'	W121°12.398'	-	9/17/2012	1439 - 1445		**< 0.1 ND**	20.9	**Standard signal ND**	**Standard signal ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Manhole 4	5	2	W	-	N45°37.637'	W121°12.398'	-	9/17/2012	1439 - 1445		**< 0.1 ND**	20.9	**Standard signal ND**	**Standard signal ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Manhole 4	5	5	N	-	N45°37.637'	W121°12.398'	-	9/17/2012	1439 - 1445		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM

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Lockheed Martin Corporation

Feature Name	Height/ Depth	Distance from Feature	Cardinal Direction from Feature	Additional Feature Information	Coordinates		Elevation	Date Collected	Time Collected	SL1/ SL 2[4]	RKI Eagle 2 w/TC				MX6 I-Brid					Colorimetric Tube[1]
											LEL[2] (%)	O_2[3] (%)	CO_2 (%)	H_2S (ppm)	CH_4 (%)	HCN (ppm)	NH_3 (ppm)	PH_3 (ppm)	H_2 (ppm)	HF (ppm)
	Feet ags	Feet			Northing	Easting	amsl				10% of LEL	19.5/ 19.5	0.5/ 3	0.0063/ 0.069	5/ 5	0.0032/ 1.005	0.63/ 1.69	0.00094/ 0.504	4/ 4	0.074/ 1.0
Manhole 4	5	5	E	-	N45°37.637'	W121°12.398'	-	9/17/2012	1439 - 1445		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Manhole 4	5	5	S	-	N45°37.637'	W121°12.398'	-	9/17/2012	1439 - 1445		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Manhole 4	5	5	W	-	N45°37.637'	W121°12.398'	-	9/17/2012	1445 Done		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Nutrient Shack	5	-	-	Doorway-Prior to venting/entry	-	-	-	9/17/2012	1445		**Standard signal ND**	Standard signal 20.9	**Standard signal ND**	**Standard signal ND**	**Standard signal ND**	**Standard signal ND**	**Standard signal ND**	**Standard signal ND**	24	NM
Nutrient Shack	5	-	-	Inside doorway-open 0.5 inches	-	-	-	9/17/2012	1445 -1555		**Standard signal ND**	Standard signal 20.9	**Standard signal ND**	**Standard signal ND**	**Standard signal ND**	**Standard signal ND**	**Standard signal ND**	**Standard signal ND**	12	NM
Nutrient Shack	5	-	-	Inside-center of shack-post-entry	-	-	-	9/17/2012	1445 -1555		**Standard signal ND**	Standard signal 20.9	**Standard signal ND**	**Standard signal ND**	**Standard signal ND**	**Standard signal ND**	**Standard signal ND**	**Standard signal ND**	81	NM
Nutrient Shack	5	-	-	Inside-center of shack-post-entry, second entry	-	-	-	9/17/2012	1445 -1555		**Standard signal ND**	20.9	**Standard signal ND**	**< 0.5 ND**	**Standard signal ND**	**< 0.1 ND**	**Standard signal ND**	**Standard signal ND**	**Standard signal ND**	**< 0.17 ND**
Nutrient Shack	Inside tank	-	-	Inside tank-not required by SAP	-	-	-	9/17/2012	1445 -1555		**Standard signal ND**	Standard signal 20.9	**Standard signal ND**	12.5	**Standard signal ND**	**Standard signal ND**	**Standard signal ND**	**Standard signal ND**	> 1000	NM
Tank Fence Line Monitoring	3	-	-	Fence line-not required by SAP	N45°37.579'	W121°12.280'	138	9/13/2012	1511		**< 0.1 ND**	20.9	0.2	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	1	**< 0.01 ND**	**< 1.0 ND**	NM
Tank Fence Line Monitoring	3	-	-	Fence line-not required by SAP	N45°37.566'	W121°12.310'	133	9/13/2012	1512		**< 0.1 ND**	20.9	0.2	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
Tank Fence Line Monitoring	3	-	-	Fence line-not required by SAP	N45°37.546'	W121°12.293'	144	9/13/2012	1513		**< 0.1 ND**	20.9	0.2	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	**< 0.17 ND**
Tank Fence Line Monitoring	3	-	-	Fence line-not required by SAP	N45°37.560'	W121°12.266'	136	9/13/2012	1515		**< 0.1 ND**	20.9	0.2	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
CERCLA Tank	5	-	-	Location 1-eastern edge-moving counterclockwise	-	-	-	9/21/2012	0812		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
CERCLA Tank	5	-	-	Location 2	-	-	-	9/21/2012	0812 - 0840		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
CERCLA Tank	5	-	-	Location 3	-	-	-	9/21/2012	0812 - 0840		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
CERCLA Tank	5	-	-	Location 4	-	-	-	9/21/2012	0812 - 0840		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
CERCLA Tank	5	-	-	Location 5	-	-	-	9/21/2012	0840-Done		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
CERCLA Utility Building	1	-	-	5 feet inside doorway-post entry	N45°37.575'	W121°12.280'	-	9/21/2012	0812		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM

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Lockheed Martin Corporation

Feature Name	Height/ Depth	Distance from Feature	Cardinal Direction from Feature	Additional Feature Information	Coordinates		Elevation	Date Collected	Time Collected	SL1/ SL 2[4]	RKI Eagle 2 w/TC				MX6 I-Brid					Colorimetric Tube[1]
											LEL[2] (%)	O_2[3] (%)	CO_2 (%)	H_2S (ppm)	CH_4 (%)	HCN (ppm)	NH_3 (ppm)	PH_3 (ppm)	H_2 (ppm)	HF (ppm)
	Feet ags	Feet			Northing	Easting	amsl				10% of LEL	19.5/ 19.5	0.5/ 3	0.0063/ 0.069	5/ 5	0.0032/ 1.005	0.63/ 1.69	0.00094/ 0.504	4/ 4	0.074/ 1.0
CERCLA Utility Building	5	-	-	5 feet inside doorway-post entry	N45°37.575'	W121°12.280'	-	9/21/2012	0812 - 1031		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
CERCLA Utility Building	8	-	-	5 feet inside doorway-post entry	N45°37.575'	W121°12.280'	-	9/21/2012	0812 - 1031		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
CERCLA Utility Building	1	-	-	15 feet inside doorway-post entry	N45°37.575'	W121°12.280'	-	9/21/2012	0812 - 1031		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
CERCLA Utility Building	5	-	-	15 feet inside doorway-post entry	N45°37.575'	W121°12.280'	-	9/21/2012	0812 - 1031		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM
CERCLA Utility Building	8	-	-	15 feet inside doorway-post entry	N45°37.575'	W121°12.280'	-	9/21/2012	0812 - 1031		**< 0.1 ND**	20.9	**< 0.02 ND**	**< 0.5 ND**	**< 1.0 ND**	**< 0.1 ND**	**< 1.0 ND**	**< 0.01 ND**	**< 1.0 ND**	NM

Notes:

LEL (Detection limit DL=0.1 %), CH_4 Methane (DL=1.0%), O_2 Oxygen (DL=0.1%), CO_2 Carbon dioxide (DL=0.1%), Hydrogen sulfide H_2S (DL=0.5 ppm), Ammonia NH_3 (DL=1.0ppm), Phosphine PH_3 (DL=0.01ppm), Hydrogen H_2 (DL=1.0 ppm), Hydrogen fluoride HF (DL=0.17 ppm)

Standard signal notation shows that standard readings were collected as demonstrated but omitted from datasheet.

[1] Sensidyne colorimetric tube 156S with AP-20S hand pump

[2] % lower explosive limit (LEL) calibrated as CH_4. Acetylene screening measurements were made as part of the LEL measurements since no separate detector was available for acetylene. LEL observed will be a function of methane, acetylene, hydrogen, and all other flammable gasses that may be present.

[3] Field readings for O_2 were recorded in the field logbooks as "0", or normal, to expedite recordation. The normal value is 20.9.

[4] SL1/SL2 = Screening Level 1/Screening Level 2; SL1 used for Industrial Worker Ambient Air Screening Levels, SL2 used for Short-Term Air Screening Levels

BOLD < with **ND** indicates less than the DL as specified by the instrument manufactures manual

Acronyms:

ags = above ground surface
amsl = above mean sea level
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
NM = Not measured
ppm = parts per million
SAP = Sampling and Analysis Plan

Table 4
RCRA Landfill Air Sampling Data
Air Sampling and Monitoring Data Report, The Dalles, Oregon
Lockheed Martin Corporation

Fence Line Sample Results (occupational hazard)

Sample Location	Sample ID [1]	Sample Date	Sorbent Tube Data						Summa Canister Data							Notes:
			NH_3 (A) mg/m³	-	HF mg/m³	HCN mg/m³	H_2S mg/m³	PH_3 mg/m³	C_2H_2 ppmv	CO_2 ppmv	H_2 %V/V	H_2S µg/m³	CH_4 ppmv	N_2 %V/V	O_2 %V/V	
Site 10 (upwind)	8	9/17/2012	< 0.111	-	< 0.004	< 0.003	< 0.029	< 0.023 (UJ)	< 1	410	< 0.21	-	1.7	78.4	21.5	ambient at fenceline
Site 4 (downwind)	11	9/17/2012	< 0.111	-	< 0.004	< 0.004	< 0.023	< 0.019	< 0.97	420	< 0.19	-	1.4	78.4	21.5	ambient at fenceline
Site 5 (downwind)	9R	9/17/2012	< 0.113	-	< 0.005	< 0.005	< 0.025	< 0.021	< 0.97	420	< 0.19	< 14 (UJ)	1.9	78.4	21.6	ambient at fenceline
Site 6 (downwind)	10R	9/17/2012	< 0.123	-	< 0.005	< 0.004	< 0.039	<0.036 (UJ)	< 1.1	420	< 0.22	< 15 (UJ)	2.7	78.4	21.6	ambient at fenceline
Screening Level 1			0.44		0.061	0.0035	0.0088	0.0013	40000	5000	4	8.8	50000	N/A	19.5	

Near Source Sample Results (worst case occupational hazard)

Sample Location	Sample ID [1]	Sample Date	Sorbent Tube Data						Summa Canister Data							Notes:
			NH_3 (A) mg/m³	-	HF mg/m³	HCN mg/m³	H_2S mg/m³	PH_3 mg/m³	C_2H_2 ppmv	CO_2 ppmv	H_2 %V/V	H_2S µg/m³	CH_4 ppmv	N_2 %V/V	O_2 %V/V	
Vent 2	1	9/15/2012	1.76	-	< 0.005	< 0.003	< 0.021	< 0.031	< 0.9	420	< 0.18	-	2.2	78.5	21.5	1 ft above ground, 1 ft downwind
RCRA Utility Bldng	4	9/15/2012	0.217	-	< 0.005	< 0.003	< 0.025	< 0.021	< 0.91	430	< 0.18	< 13 (UJ)	3.0	78.5	21.5	I ft above floor, 1 ft from sump
Screening Level 2			1.180		0.820	1.105	0.097	0.700	40000	30000	4	97	50000	N/A	19.5	

Source Sample Results (confined space)

Sample Location	Sample ID [1]	Sample Date	Sorbent Tube Data						Summa Canister Data							Notes:
			NH_3 (A) mg/m³	NH_3 (B) mg/m³	HF mg/m³	HCN mg/m³	H_2S mg/m³	PH_3 mg/m³	C_2H_2 ppmv	CO_2 ppmv	H_2 %V/V		CH_4 ppmv	N_2 %V/V	O_2 %V/V	
RCRA Sump	3, 3R	9/15/2012	16.5	-	0.007	< 0.003	< 0.020	< 0.024	< 0.89	0.37	< 0.18	-	340	80.1	19.5	in RCRA utility building
Vent 1	5	9/16/2012	132 (J-)	395 (J-)	0.007 (J-)	< 0.002	< 0.016	< 0.015	5.9	620	3.11	-	2.7	82.7	11.4	6 feet down pipe
Vent 2	6	9/16/2012	111 (J-)	354 (J-)	0.014 (J-)	< 0.002	< 0.012	< 0.012	5	520	2.15	-	2.2	82.6	13.0	6 feet down pipe
Vent 3	7	9/16/2012	111 (J-)	436 (J-)	0.010 (J-)	0.003 (J-)	< 0.016	< 0.014	3.9	390	1.67	-	1.8	82.1	14.4	6 feet down pipe

[1] See sample code in Appendix A.

Notes:

Sorbent tube sample resutls corrected to standard conditions.

A and B designations distinguish between 3-hour and 1-hour ammonia samples, respectively.

mg/m^3 = milligrams per cubic meter

ppmv = parts per million by volume

$\mu g/m^3$ = micrograms per cubic meter

%V/V = percent volume by volume

< 0.123 = indicates not detected at the specified detection limit.

UJ = The analyte was not detected. The reported quantification limit is approximate and may be inaccurate or imprecise.

J- = The result is an estimated quantity, but may be biased low.

RCRA = Resource Conservation and Recovery Act

Screening Level 1: Industrial Worker Ambient Air Screening Levels

Screening Level 2: Short-Term Air Screening Leve

Sorbent

NH_3 - Ammonia

HF - Hydrogen Fluoride

HCN - Hydrogen Cyanide

H_2S - Hydrogen Sulfide

PH_3 - Phosphine

Summa

C_2H_2 - Acetylene

CO_2 - Carbon Dioxide

H_2 - Hydrogen

CH_4 - Methane

N_2 - Nitrogen

O_2 - Oxygen

Table 5
CERCLA Landfill Air Sampling Data
Air Sampling and Monitoring Data Report, The Dalles, Oregon
Lockheed Martin Corporation

Fence Line Sample Results (occupational hazard)

Sample Location	Sample ID [1]	Sample Date	Sorbent Tube Data					Summa Canister Data							Notes:
			NH_3	HF	HCN	H_2S	PH_3	C_2H_2	CO_2	H_2	H_2S	CH_4	N_2	O_2	
			mg/m³	mg/m³	mg/m³	mg/m³	mg/m³	ppmv	ppmv	%V/V	µg/m³	ppmv	%V/V	%V/V	
Site 11 (upwind)	13	9/18/2012	< 0.123	< 0.004	< 0.004	< 0.024	< 0.029	< 0.76	430	< 0.15	< 11 (UJ)	2.7	78.4	21.5	ambient at fenceline
Site 2 (downwind)	14	9/18/2012	< 0.112	< 0.004	< 0.004	< 0.023	< 0.025	< 0.77	440	< 0.15	< 11 (UJ)	1.9	78.4	21.5	ambient at fenceline
Site 18 (downwind)	15	9/18/2012	< 0.123	< 0.003	< 0.004	< 0.027	< 0.024	< 0.8	440	< 0.16	< 11 (UJ)	2.2	78.4	21.5	ambient at fenceline
Site 16 (downwind)	16	9/18/2012	< 0.112	< 0.004	< 0.004	< 0.030	< 0.021	< 0.8	440	< 0.16	< 11 (UJ)	2.2	78.4	21.5	ambient at fenceline
Screening Level 1			0.44	0.061	0.0035	0.0088	0.0013	40000	5000	4	8.8	50000	N/A	19.5	

Near Source Sample Results (worst case occupational hazard)

Sample Location	Sample ID [1]	Sample Date	Sorbent Tube Data					Summa Canister Data							Notes:
			NH_3	HF	HCN	H_2S	PH_3	C_2H_2	CO_2	H_2	H_2S	CH_4	N_2	O_2	
			mg/m³	mg/m³	mg/m³	mg/m³	mg/m³	ppmv	ppmv	%V/V	µg/m³	ppmv	%V/V	%V/V	
Nutrient Shack	12	9/18/2012	< 0.111	< 0.004	< 0.005	< 0.027	< 0.024	< 0.97	440	< 0.19	< 13 (UJ)	2.2	78.5	21.5	on work bench (4 ft above floor)
Lift Station 1	19	9/19/2012	< 0.112	< 0.005	< 0.005	< 0.024	< 0.019	< 1	440	< 0.21	< 14	1.7	78.4	21.6	1 ft above ground, 1 ft downwind
Manhole 2	25	9/20/2012	< 0.122	< 0.004	< 0.005	< 0.029	< 0.019 (UJ)	< 0.75	500	< 0.15	< 10	1.7	78.4	21.5	1 ft above ground, 1 ft downwind
Screening Level 2			1.180	0.820	1.105	0.097	0.700	40000	30000	4	97	50000	N/A	19.5	

Source Sample Results (confined space)

Sample Location	Sample ID [1]	Sample Date	Sorbent Tube Data					Summa Canister Data							Notes:
			NH_3	HF	HCN	H_2S	PH_3	C_2H_2	CO_2	H_2	H_2S	CH_4	N_2	O_2	
			mg/m³	mg/m³	mg/m³	mg/m³	mg/m³	ppmv	%V/V	%V/V	µg/m³	ppmv	%V/V	%V/V	
Manhole 1	20	9/19/2012	< 0.112	< 0.004	< 0.004	< 0.029	< 0.020	< 0.74	0.419	< 0.15	< 10	1.2	80.5	19.1	10 ft into manhole
Manhole 2	21	9/19/2012	< 0.122	< 0.007	< 0.004	< 0.027	< 0.018	< 0.74	0.496	< 0.15	< 10	1.6	80.5	19	10 ft into manhole
Manhole 4	17	9/19/2012	< 0.122	< 0.004	< 0.004	< 0.023	<0.020 (UJ)	< 0.75	0.551	< 0.15	< 10	6.3	79.3	20.2	10 ft into manhole
Manhole 4 (duplicate)	18	9/19/2012	< 0.112	< 0.004	< 0.004	< 0.026	NM	< 0.74	0.56	< 0.15	< 10	6.2	79.3	20.1	10 ft into manhole
Lift Station 1	23	9/20/2012	< 0.132	< 0.005	< 0.005	< 0.029	<0.021 (UJ)	< 0.76	0.732	< 0.15	< 11	8.4	79.7	19.5	10 ft into manhole
Lift Station 1	26	9/20/2012	< 0.122	0.013	< 0.004	< 0.025	<0.024 (UJ)	< 0.79	0.562	< 0.16	< 11	6.5	79.5	19.9	extraction comparison
Lift Station 2	22	9/20/2012	< 0.112	< 0.004	< 0.004	< 0.024	<0.019 (UJ)	< 0.78	0.16	< 0.16	< 11	150	78.6	21.2	10 ft into manhole
Manhole 3	24	9/20/2012	< 0.112	< 0.005	< 0.004	0.042 (J+)	<0.022 (UJ)	< 0.73	0.23	< 0.15	< 10	420	78.5	21.3	10 ft into manhole

Notes:

Sorbent tube sample resutls corrected to standard conditions.

mg/m^3 = milligrams per cubic meter

ppmv = parts per million by volume

$\mu g/m^3$ = micrograms per cubic meter

%V/V = percent volume by volume

< 0.123 = indicates not detected at the specified detection limit.

UJ = The analyte was not detected. The reported quantification limit is approximate and may be inaccurate or imprecise

J+ = The result is an estimated quantity, but may be biased high.

CERCLA = Comprehensive Response, Compensation, and Liability Act

NM = Manhole 4 duplicate phosphine sample not analyzed due to being lost inside manhole

Screening Level 1: Industrial Worker Ambient Air Screening Levels

Screening Level 2: Short-Term Air Screening Level

Sorbent

NH_3 - Ammonia

HF - Hydrogen Fluoride

HCN - Hydrogen Cyanide

H_2S - Hydrogen Sulfide

PH_3 - Phosphine

Summa

C_2H_2 - Acetylene

CO_2 - Carbon Dioxide

H_2 - Hydrogen

CH_4 - Methane

N_2 - Nitrogen

O_2 - Oxygen

Table 6
Comparison of Summa Canister Samples Collected Directly in Lift Station vs. through Teflon Probe
Air Sampling and Monitoring Data Report, The Dalles, Oregon
Lockheed Martin Corporation

Sample	Date Collected	Analytical Method	Sampling Method	Analyte Name	Result Flags	Result	Units	RL/QL	Sample Location #
S-23	9/21/2012	3C	Direct draw	Carbon Dioxide		**0.732**	%V/V	0.15	23
S-23	9/21/2012	3C	Direct draw	Hydrogen	<	0.15	%V/V	0.15	23
S-23	9/21/2012	ASTM D 5504-08	Direct draw	Hydrogen Sulfide	<	11	$\mu g/m^3$	11	23
S-23	9/21/2012	3C	Direct draw	Nitrogen		79.7	%V/V	0.15	23
S-23	9/21/2012	3C	Direct draw	Oxygen + Argon		19.5	%V/V	0.15	23
S-26	9/21/2012	3C	Teflon Tubing	Carbon Dioxide		**0.562**	%V/V	0.16	26
S-26	9/21/2012	3C	Teflon Tubing	Hydrogen	<	0.16	%V/V	0.16	26
S-26	9/21/2012	ASTM D 5504-08	Teflon Tubing	Hydrogen Sulfide	<	11	$\mu g/m^3$	11	26
S-26	9/21/2012	3C	Teflon Tubing	Nitrogen		79.5	%V/V	0.16	26
S-26	9/21/2012	3C	Teflon Tubing	Oxygen + Argon		19.9	%V/V	0.16	26

Acronyms:

%V/V = percent volume by volume

RL/QL = Reporting Limit / Quantitation Limit

$\mu g/m^3$ = micrograms per cubic meter

Table 7
Comparison of Extractive/Sorbent Samples Collected with the Sample Media Directly in the Lift Station vs. Teflon Probe
Air Sampling and Monitoring Data Report, The Dalles, Oregon
Lockheed Martin Corporation

Sample	Date Collected	Analytical Method	Sample Collection Method	Analyte Name	Result Flags	Result
NH3-23	9/20/2012	OSHA ID-188/ID-164	Direct draw	Ammonia	<	0.13
HF-23	9/20/2012	NIOSH 7903	Direct draw	Hydrofluoric acid	<	0.0048
HCN-23	9/20/2012	NIOSH 6010	Direct draw	Hydrogen Cyanide	<	0.0047
H2S-23	9/20/2012	OSHA 1008	Direct draw	Hydrogen sulfide	<	0.029
PH3-23	9/20/2012	OSHA 1003 Mod.	Direct draw	Phosphine	<	0.021
NH3-26	9/20/2012	OSHA ID-188/ID-164	Teflon Probe	Ammonia	<	0.12
HF-26	9/20/2012	NIOSH 7903	Teflon Probe	Hydrofluoric acid		0.013
HCN-26	9/20/2012	NIOSH 6010	Teflon Probe	Hydrogen Cyanide	<	0.0044
H2S-26	9/20/2012	OSHA 1008	Teflon Probe	Hydrogen sulfide	<	0.025
PH3-26	9/20/2012	OSHA 1003 Mod.	Teflon Probe	Phosphine	<	0.024

Note:

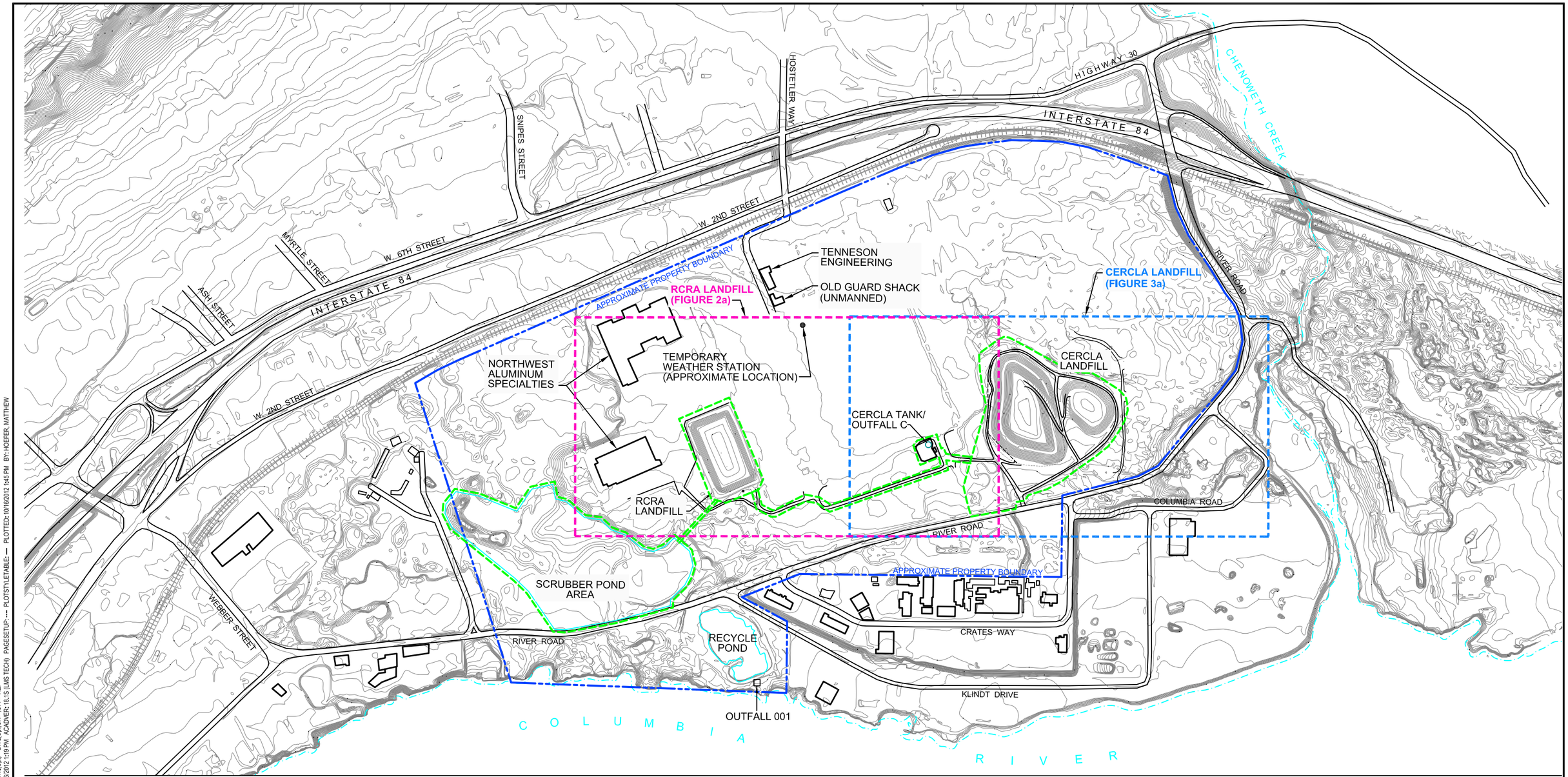
All values given in milligrams per cubic meter.

Data for phosphine (both samples) determined to be non-detectable during data validation process.

< 0.123 = indicates not detected at the specified detection limit.

ARCADIS

Figures



LEGEND

- CERCAL LANDFILL MONITORING WELL LOCATION
- RCRA LANDFILL MONITORING WELL LOCATION
- NORTHWEST ALUMINUM MONITORING WELL LOCATION
- NORTHWEST ALUMINUM PROPERTY BOUNDARY
- LOCKHEED MARTIN PROPERTY BOUNDARY

NOTE

THE SITE IS LOCATED ABOVE THE 100 YEAR FLOODPLAIN.
THE FLOODPLAIN IS NOT INDICATED ON THIS MAP.

N

0 350 700 1050

APPROXIMATE SCALE IN FEET
1" = 700'

LOCKHEED MARTIN CORPORATION SITE
THE DALLES, OREGON

SITE LAYOUT
FACILITIES AND PROJECT AREA

ARCADIS

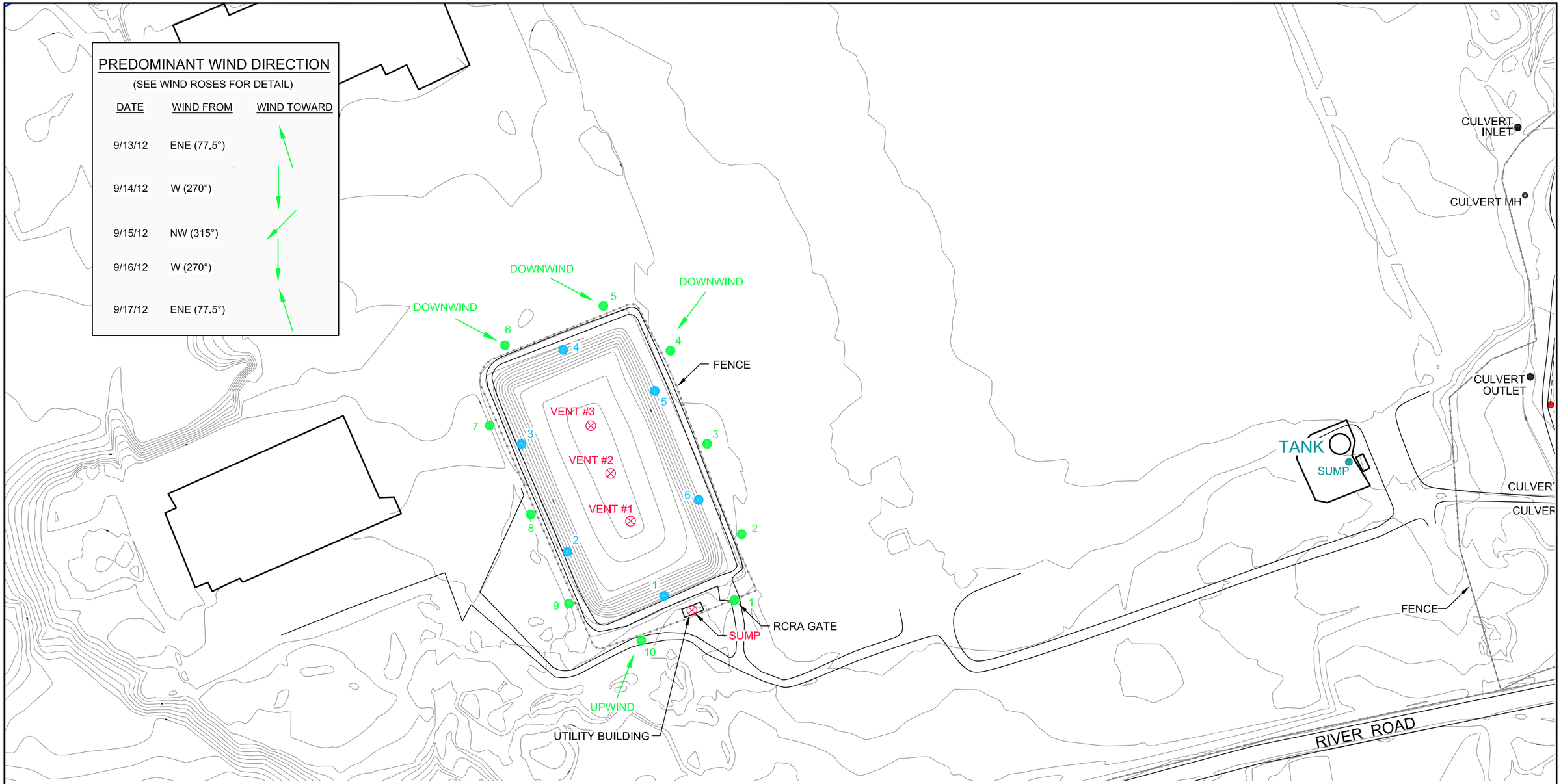
FIGURE 1

CITY:(Reqd) DIV/GROUP:(Reqd) DB:(Reqd) LD:(Opt) PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(On)(Off)*:'OFF*:'REF'
C:\Montana\LMC\COBAS-1116.dwg LAYOUT: 11X17-SITE CONTOUR SAVED: 10/16/2012 1:19 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: --- PLOTTED: 10/16/2012 1:45 PM BY: HOEFER, MATTHEW

PREDOMINANT WIND DIRECTION

(SEE WIND ROSES FOR DETAIL)

DATE	WIND FROM	WIND TOWARD
9/13/12	ENE (77.5°)	
9/14/12	W (270°)	
9/15/12	NW (315°)	
9/16/12	W (270°)	
9/17/12	ENE (77.5°)	



LEGEND

RCRA LANDFILL

VENT #3 ⊗ SOURCE LOCATIONS (VENTS AND SUMP)

4 ● CAP DRAINS

2 ● FENCE LINE MONITORING LOCATIONS

FENCE LINE SAMPLE LOCATIONS

MH #4 ⊖ MANHOLE

FENCE LINE MONITORING LOCATIONS

STARTING WITH THE LANDFILL GATE, MONITOR READINGS EVERY 200 FEET (9/13/12)

FENCE LINE SAMPLING LOCATIONS

ONE SAMPLE SET UPWIND, THREE SETS DOWNWIND (9/17/12)

SOURCE AND NEAR SOURCE MONITORING LOCATIONS (9/14/12)

RCRA UTILITY BUILDING (DOORWAYS, UTILITY OPENINGS, THEN INSIDE VIA TUBING EXTENSIONS THROUGH BUILDING AIR VENTS)

LANDFILL CAP DRAINS

LANDFILL VENTS

SOURCE AND NEAR SOURCE SAMPLING LOCATIONS

RCRA UTILITY BUILDING AND SUMP (9/15/12)

AMBIENT SAMPLE NEAR VENT #2 (9/15/12)

RCRA LANDFILL VENTS (3 DOWN HOLE) (9/16/12)

N

0 100' 200' 300'

APPROXIMATE SCALE IN FEET
1" = 200'

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RCRA LANDFILL FENCE LINE, SOURCE AND NEAR SOURCE MONITORING AND SAMPLING LOCATIONS

LOCKHEED MARTIN CORPORATION SITE
THE DALLES, OREGON

Project Number	GP000677.2012
Drawing Date	10/10/12
Figure	2a

PREDOMINANT WIND DIRECTION

(SEE WIND ROSES FOR DETAIL)

DATE	WIND FROM	WIND TOWARD
9/13/12	ENE (77.5°)	
9/14/12	W (270°)	
9/15/12	NW (315°)	
9/16/12	W (270°)	
9/17/12	ENE (77.5°)	

Site 6 (fence) (ID 10R)
9/17/2012 (Sorbent)
NH_3 = < 0.123 mg/m³
HF = < 0.005 mg/m³
HCN = < 0.004 mg/m³
H_2S = < 0.039 mg/m³
PH_3 = < 0.036 mg/m³ (UJ)
9/17/2012 (Summa)
C_2H_2 < 1.1 ppmV
CO_2 = 420 ppmV
H_2 = < 0.22 %V/V
H_2S = < 15 ug/m³ (UJ)
CH_4 = 2.7 ppmV
N_2 = 78.4 %V/V
O_2 = 21.6 %V/V

Site 5 (fence) (ID 9R)
9/17/2012 (Sorbent)
NH_3 = < 0.113 mg/m³
HF = < 0.005 mg/m³
HCN = < 0.005 mg/m³
H_2S = < 0.025 mg/m³
PH_3 = < 0.021 mg/m³
9/17/2012 (Summa)
C_2H_2 < 0.97 ppmV
CO_2 = 420 ppmV
H_2 = < 0.19 %V/V
H_2S = < 14 ug/m³ (UJ)
CH_4 = 1.9 ppmV
N_2 = 78.4 %V/V
O_2 = 21.6 %V/V

Site 4 (fence) (ID 11)
9/17/2012 (Sorbent)
NH_3 = < 0.111 mg/m³
HF = < 0.004 mg/m³
HCN = < 0.004 mg/m³
H_2S = < 0.023 mg/m³
PH_3 = < 0.019 mg/m³
9/17/2012 (Summa)
C_2H_2 < 0.97 ppmV
CO_2 = 420 ppmV
H_2 = < 0.19 %V/V
CH_4 = 1.4 ppmV
N_2 = 78.4 %V/V
O_2 = 21.5 %V/V

Site 10 (fence) (ID 8)
9/17/2012 (Sorbent)
NH_3 = < 0.111 mg/m³
HF = < 0.004 mg/m³
HCN = < 0.003 mg/m³
H_2S = < 0.029 mg/m³
PH_3 = < 0.023 mg/m³ (UJ)
9/17/2012 (Summa)
C_2H_2 < 1 ppmV
CO_2 = 410 ppmV
H_2 = < 0.21 %V/V
CH_4 = 1.7 ppmV
N_2 = 78.4 %V/V
O_2 = 21.5 %V/V

DOWNWIND
DOWNWIND
DOWNWIND
UPWIND
FENCE
VENT #3
VENT #2
VENT #1
SUMP
RCRA GATE
UTILITY BUILDING
CULVERT INLET
CULVERT MH
CULVERT OUTLET
TANK
SUMP
FENCE
RIVER ROAD

0 100' 200' 300'
APPROXIMATE SCALE IN FEET
1" = 200'

LEGEND

RCRA LANDFILL

VENT #3 ⊗ SOURCE LOCATIONS (VENTS AND SUMP)
4 ● CAP DRAINS
2 ● FENCE LINE MONITORING LOCATIONS
FENCE LINE SAMPLE LOCATIONS
MH #4 ⊖ MANHOLE

FENCE LINE MONITORING LOCATIONS
STARTING WITH THE LANDFILL GATE, MONITOR READINGS EVERY 200 FEET (9/13/12)

FENCE LINE SAMPLING LOCATIONS
ONE SAMPLE SET UPWIND, THREE SETS DOWNWIND (9/17/12)

Sorbent Analytes	Units
NH_3 - Ammonia	mg/m³
HF - Hydrogen Fluoride	mg/m³
HCN - Hydrogen Cyanide	mg/m³
H_2S - Hydrogen Sulfide	mg/m³
PH_3 - Phosphine	mg/m³

(mg/m³ = milligrams / cubic meter)

Summa Analytes	Units
C_2H_2 - Acetylene	ppmV
CO_2 - Carbon Dioxide	ppmV
H_2 - Hydrogen	%V/V
CH_4 - Methane	ppmV
N_2 - Nitrogen	%V/V
O_2 - Oxygen	%V/V

(ppmV = parts per million by volume)
(%V/V = percent volume by volume)

ID 9R = SAMPLE ID 9R. SAMPLE IDS WITH AN R ARE SAMPLE SITES MOVED DUE TO WIND DIRECTION, NEW SAMPLES WERE PLACED.
<0.123 = INDICATES NOT DETECTED AT THE SPECIFIED DETECTION LIMIT
U J = THE ANALYTE WAS NOT DETECTED. THE REPORTED QUANTIFICATION LIMIT IS APPROXIMATE AND MAY BE INACCURATE OR IMPRECISE
SORBENT TUBE DATA CORRECTED TO STANDARD CONDITIONS
BOLD DATA INDICATES ANALYTICAL DETECTION

Drafter: M. HOEFER
Project Manager: K.W. SMITH
Task Manager: M. RISHER
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RCRA LANDFILL FENCE LINE SAMPLING RESULTS

LOCKHEED MARTIN CORPORATION SITE
THE DALLES, OREGON

Project Number: GP000677.2012
Drawing Date: 10/10/12
Figure: 2b

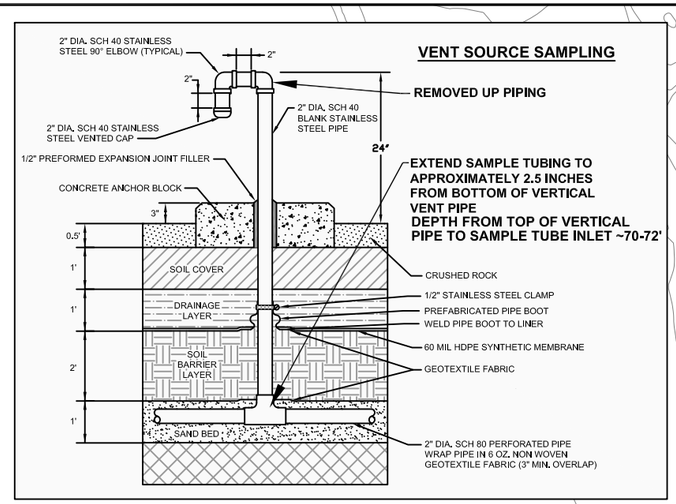
PREDOMINANT WIND DIRECTION

(SEE WIND ROSES FOR DETAIL)

DATE	WIND FROM	WIND TOWARD
9/13/12	ENE (77.5°)	
9/14/12	W (270°)	
9/15/12	NW (315°)	
9/16/12	W (270°)	
9/17/12	ENE (77.5°)	

Vent 2 (6 ft down pipe)
(ID 6)
9/16/2012 (Sorbent)
NH_3 (A) = 111 mg/m³ (J-)
NH_3 (B) = 354 mg/m³ (J-)
HF = 0.014 mg/m³ (J-)
HCN = < 0.002 mg/m³
H_2S = < 0.012 mg/m³
PH_3 = < 0.012 mg/m³
9/16/2012 (Summa)
C_2H_2 = 5 ppmV
CO_2 520 ppmV
H_2 = 2.15 %V/V
CH_4 = 2.2 %V/V
N_2 = 82.6 %V/V
O_2 = 13 %V/V

Vent 2 (ambient)
(ID 1)
9/15/2012 (Sorbent)
NH_3 = 1.76 mg/m³
HF = < 0.005 mg/m³
HCN = < 0.003 mg/m³
H_2S = < 0.021 mg/m³
PH_3 = < 0.031 mg/m³
9/15/2012 (Summa)
C_2H_2 = < 0.9 ppmV
CO_2 420 ppmV
H_2 = < 0.18 %V/V
CH_4 = 2.2 ppmV
N_2 = 78.5 %V/V
O_2 = 21.5 %V/V



VENT SOURCE SAMPLING
REMOVED UP PIPING
EXTEND SAMPLE TUBING TO APPROXIMATELY 2.5 INCHES FROM BOTTOM OF VERTICAL VENT PIPE
DEPTH FROM TOP OF VERTICAL PIPE TO SAMPLE TUBE INLET ~70-72'

TYPICAL COVER/GAS VENTING SYSTEM INTERFACE DETAIL
NOT TO SCALE

Vent 3 (6 ft down pipe)
(ID 7)
9/16/2012 (Sorbent)
NH_3 (A) = 111 mg/m³ (J-)
NH_3 (B) = 436 mg/m³ (J-)
HF = 0.010 mg/m³ (J-)
HCN = 0.003 mg/m³ (J-)
H_2S = < 0.016 mg/m³
PH_3 = < 0.014 mg/m³
9/16/2012 (Summa)
C_2H_2 = 3.9 ppmV
CO_2 390 ppmV
H_2 = 1.67 %V/V
CH_4 = 1.8 %V/V
N_2 = 82.1 %V/V
O_2 = 14.4 %V/V

Vent 1 (6 ft down pipe)
(ID 5)
9/16/2012 (Sorbent)
NH_3 (A) = 132 mg/m³ (J-)
NH_3 (B) = 395 mg/m³ (J-)
HF = 0.007 mg/m³ (J-)
HCN = < 0.002 mg/m³
H_2S = < 0.016 mg/m³
PH_3 = < 0.015 mg/m³
9/16/2012 (Summa)
C_2H_2 = 5.9 ppmV
CO_2 = 620 ppmV
H_2 = 3.11 %V/V
CH_4 = 2.7 %V/V
N_2 = 82.7 %V/V
O_2 = 11.4 %V/V

RCRA Utility Bldng (ID 4)
(near sump)
9/15/2012 (Sorbent)
NH_3 = 0.217 mg/m³
HF < 0.005 mg/m³
HCN < 0.003 mg/m³
H_2S < 0.025 mg/m³
PH_3 < 0.021 mg/m³
9/15/2012 (Summa)
C_2H_2 < 0.91 ppmV
CO_2 430 ppmV
H_2 < 0.18 %V/V
H_2S < 13 ug/m³ (UJ)
CH_4 = 3 ppmV
N_2 = 78.5 %V/V
O_2 = 21.5 %V/V

RCRA Utility Bldng Sump
(ID 3, 3R)
(18 inches inside sump)
9/15/2012 (Sorbent)
NH_3 = 16.5 mg/m³
HF = 0.007 mg/m³
HCN = < 0.003 mg/m³
H_2S = < 0.020 mg/m³
PH_3 = < 0.024 mg/m³
9/15/2012 (Summa)
C_2H_2 = < 0.89 ppmV
CO_2 0.37 %V/V
H_2 = < 0.18 %V/V
CH_4 = 340 ppmV
N_2 = 80.1 %V/V
O_2 = 19.5 %V/V

DOWNWIND
DOWNWIND
DOWNWIND
FENCE
VENT #3
VENT #2
VENT #1
SUMP
UPWIND
RCRA GATE
UTILITY BUILDING
TANK
SUMP
CULVER
CULVER
FENCE
RIVER ROAD

0 100' 200' 300'
APPROXIMATE SCALE IN FEET
1" = 200'

LEGEND

RCRA LANDFILL

VENT #3 ⊗ SOURCE LOCATIONS (VENTS AND SUMP)
4 ● CAP DRAINS
2 ● FENCE LINE MONITORING LOCATIONS
FENCE LINE SAMPLE LOCATIONS
MH #4 ⊖ MANHOLE

SOURCE MONITORING LOCATIONS (9/14/12)
RCRA UTILITY BUILDING (DOORWAYS, UTILITY OPENINGS, THEN INSIDE VIA TUBING EXTENSIONS THROUGH BUILDING AIR VENTS)
LANDFILL CAP DRAINS
LANDFILL VENTS

SOURCE SAMPLING LOCATIONS
RCRA UTILITY BUILDING AND SUMP (9/15/12)
AMBIENT SAMPLE NEAR VENT #2 (9/15/12)
RCRA LANDFILL VENTS (3 DOWN HOLE) (9/16/12)

Sorbent Analytes	Units
NH_3 - Ammonia	mg/m³
HF - Hydrogen Fluoride	mg/m³
HCN - Hydrogen Cyanide	mg/m³
H_2S - Hydrogen Sulfide	mg/m³
PH_3 - Phosphine	mg/m³

(mg/m³ = milligrams / cubic meter)

Summa Analytes	Units
C_2H_2 - Acetylene	ppmV
CO_2 - Carbon Dioxide	ppmV
H_2 - Hydrogen	%V/V
CH_4 - Methane	ppmV
N_2 - Nitrogen	%V/V
O_2 - Oxygen	%V/V

(ppmV = parts per million by volume)
(%V/V = percent volume by volume)

ID 6 = SAMPLE ID 6. SAMPLE ID 3R WAS RESAMPLED FOR H2S ONLY (9/16/12)
<0.123 = INDICATES NOT DETECTED AT THE SPECIFIED DETECTION LIMIT
U J = THE ANALYTE WAS NOT DETECTED. THE REPORTED QUANTIFICATION LIMIT IS APPROXIMATE AND MAY BE INACCURATE OR IMPRECISE
J = THE RESULT IS AN ESTIMATED QUANTITY, BUT MAY BE BIASED LOW
A AND B DESIGNATIONS DISTINGUISH BETWEEN 3-HOUR AND 1 HOUR AMMONIA SAMPLES, RESPECTIVELY
SORBENT TUBE DATA CORRECTED TO STANDARD CONDITIONS
BOLD DATA INDICATES ANALYTICAL DETECTION

Drafter: M. HOEFER
Project Manager: K.W. SMITH
Task Manager: M. RISHER
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RCRA LANDFILL SOURCE AND NEAR SOURCE SAMPLING RESULTS

LOCKHEED MARTIN CORPORATION SITE
THE DALLES, OREGON

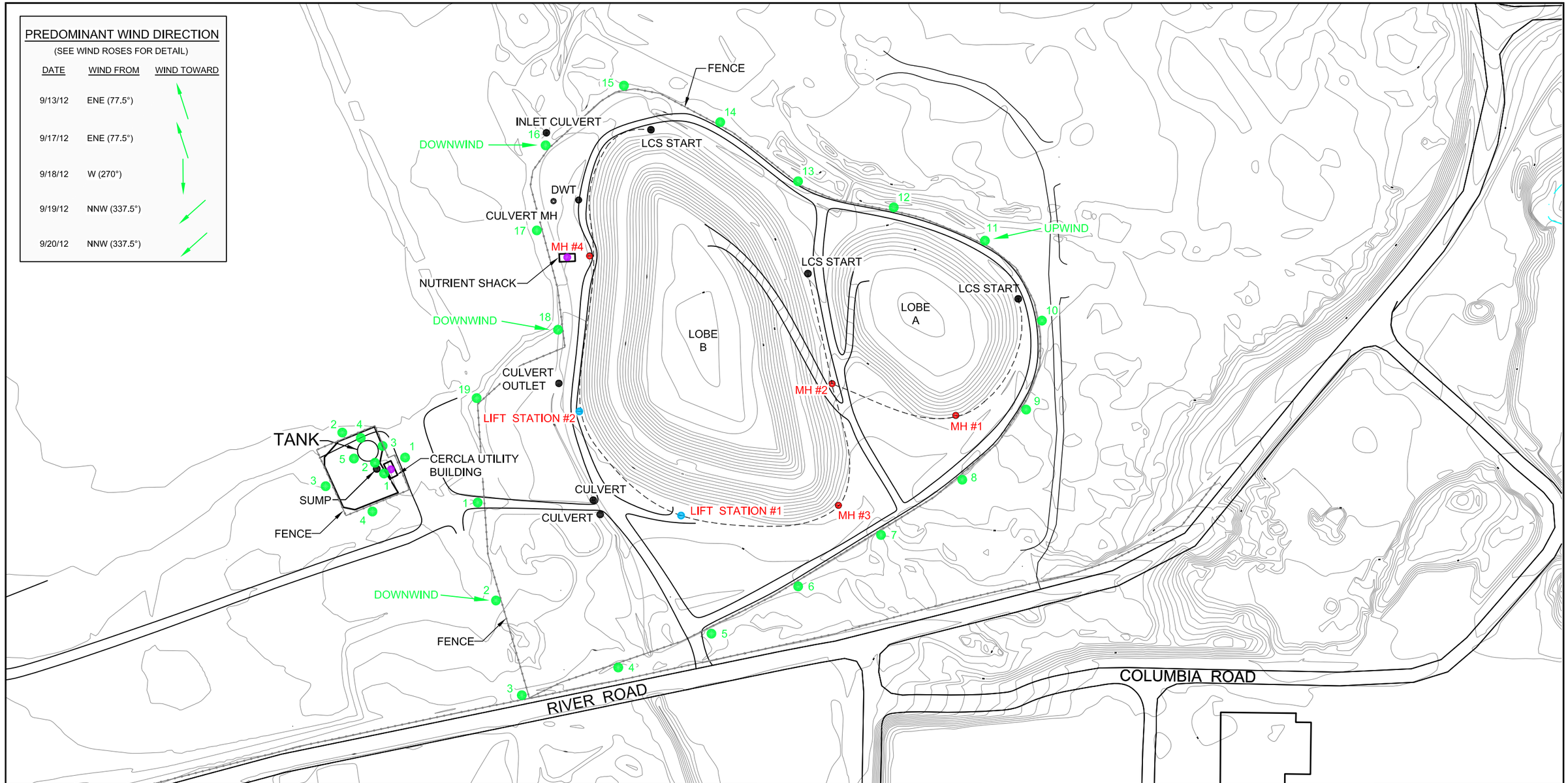
Project Number: GP000677.2012
Drawing Date: 10/10/12
Figure: 2c

Current Plotstyle : ByColor
Layout : Tab: FIG 2c
Date\Time : Fri, 26 Oct 2012 – 5:23pm
Path\Name : C:\Montana\LMC\COLOC-04489.dwg
Acad Version : R18.1s (LMS Tech)
User Name : MHoefer

PREDOMINANT WIND DIRECTION

(SEE WIND ROSES FOR DETAIL)

DATE	WIND FROM	WIND TOWARD
9/13/12	ENE (77.5°)	
9/17/12	ENE (77.5°)	
9/18/12	W (270°)	
9/19/12	NNW (337.5°)	
9/20/12	NNW (337.5°)	



LEGEND

- MH #3 — MANHOLE
- LIFT STATION #1 — LIFT STATION
- NUTRIENT SHACK AND CERCLA UTILITY BUILDING
- 3 — FENCE LINE MONITORING LOCATIONS
- FENCE LINE SAMPLE LOCATIONS

CERCLA LANDFILL

FENCE LINE AND TANK MONITORING LOCATIONS
STARTING AT GATES MONITOR READINGS EVERY 200 FEET (9/13/12)
TANK AREA (9/21/12)

FENCE LINE SAMPLING LOCATIONS
ONE SAMPLE SET UPWIND, THREE SETS DOWNWIND (9/18/12)

SOURCE AND NEAR SOURCE MONITORING LOCATIONS
CERCLA UTILITY BUILDING, MANHOLES, LIFT STATION, NUTRIENT SHACK (9/17/12)

SOURCE AND NEAR SOURCE SAMPLING LOCATIONS
MH's 1,2 AND 4 (DOWNHOLE) 9/19/12
AMBIENT SAMPLE NEAR LS 1 (9/19/12)
MH #3 AND LS's AND 1, 2 (9/20/12)
LS 1 EXTRACTION COMPARISON SAMPLE (9/20/12)
AMBIENT SAMPLE MH #3 (9/20/12)

N

0 100' 200' 300'

APPROXIMATE SCALE IN FEET
1" = 200'

Drafter	M. HOEFER
Project Manager	K.W. SMITH
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CERCLA LANDFILL FENCE LINE, SOURCE AND NEAR SOURCE MONITORING AND SAMPLING LOCATIONS

LOCKHEED MARTIN CORPORATION SITE
THE DALLES, OREGON

Project Number	GP000677.2012
Drawing Date	10/10/12
Figure	3a

PREDOMINANT WIND DIRECTION

(SEE WIND ROSES FOR DETAIL)

DATE	WIND FROM	WIND TOWARD
9/13/12	ENE (77.5°)	
9/17/12	ENE (77.5°)	
9/18/12	W (270°)	
9/19/12	NNW (337.5°)	
9/20/12	NNW (337.5°)	

Site 16 (fence) (ID 16)
9/18/2012 (Sorbent)
NH_3 = < 0.112 mg/m³
HF = < 0.004 mg/m³
HCN = < 0.004 mg/m³
H_2S = < 0.030 mg/m³
PH_3 = < 0.021 mg/m³
9/18/2012 (Summa)
C_2H_2 = < 0.8 ppmV
CO_2 = 440 ppmV
H_2 = < 0.16 %V/V
H_2S = < 11 ug/m3 (UJ)
CH_4 = 2.2 ppmV
N_2 = 78.4 %V/V
O_2 = 21.5 %V/V

Site 11 (fence) (ID 13)
9/18/2012 (Sorbent)
NH_3 = < 0.123 mg/m³
HF = < 0.004 mg/m³
HCN = < 0.004 mg/m³
H_2S = < 0.024 mg/m³
PH_3 = < 0.029 mg/m³
9/18/2012 (Summa)
C_2H_2 = < 0.76 ppmV
CO_2 = 430 ppmV
H_2 = < 0.15 %V/V
H_2S = < 11 ug/m3 (UJ)
CH_4 = 2.7 ppmV
N_2 = 78.4 %V/V
O_2 = 21.5 %V/V

Site 18 (fence) (ID 15)
9/18/2012 (Sorbent)
NH_3 = < 0.123 mg/m³
HF = < 0.003 mg/m³
HCN = < 0.004 mg/m³
H_2S = < 0.027 mg/m³
PH_3 = < 0.024 mg/m³
9/18/2012 (Summa)
C_2H_2 = < 0.8 ppmV
CO_2 = 440 ppmV
H_2 = < 0.16 %V/V
H_2S = < 11 ug/m3 (UJ)
CH_4 = 2.2 ppmV
N_2 = 78.4 %V/V
O_2 = 21.5 %V/V

Site 2 (fence) (ID 14)
9/18/2012 (Sorbent)
NH_3 = < 0.112 mg/m³
HF = < 0.004 mg/m³
HCN = < 0.004 mg/m³
H_2S = < 0.023 mg/m³
PH_3 = < 0.025 mg/m³
9/18/2012 (Summa)
C_2H_2 = < 0.77 ppmV
CO_2 = 440 ppmV
H_2 = < 0.15 %V/V
H_2S = < 11 ug/m3 (UJ)
CH_4 = 1.9 ppmV
N_2 = 78.4 %V/V
O_2 = 21.5 %V/V

FENCE
INLET CULVERT
DOWNWIND
DWT
CULVERT MH
MH #4
NUTRIENT SHACK
DOWNWIND
CULVERT OUTLET
LIFT STATION #2
TANK
CERCLA UTILITY BUILDING
SUMP
FENCE
CULVERT
CULVERT
LIFT STATION #1
MH #3
DOWNWIND
FENCE
RIVER ROAD
LCS START
LCS START
LCS START
UPWIND
LOBE B
LOBE A
MH #2
MH #1
COLUMBIA ROAD

0 100' 200' 300'
APPROXIMATE SCALE IN FEET
1" = 200'

LEGEND

MH #3 MANHOLE
LIFT STATION #1 LIFT STATION
NUTRIENT SHACK AND CERCLA UTILITY BUILDING
3 FENCE LINE MONITORING LOCATIONS
FENCE LINE SAMPLE LOCATIONS

CERCLA LANDFILL

FENCE LINE AND TANK MONITORING LOCATIONS
STARTING AT GATES MONITOR READINGS EVERY 200 FEET (9/13/12)
TANK AREA (9/21/12)

FENCE LINE SAMPLING LOCATIONS
ONE SAMPLE SET UPWIND, THREE SETS DOWNWIND (9/18/12)

Sorbent Analytes	Units
NH_3 - Ammonia	mg/m³
HF - Hydrogen Fluoride	mg/m³
HCN - Hydrogen Cyanide	mg/m³
H_2S - Hydrogen Sulfide	mg/m³
PH_3 - Phosphine	mg/m³

(mg/m³ = milligrams / cubic meter)

Summa Analytes	Units
C_2H_2 - Acetylene	ppmV
CO_2 - Carbon Dioxide	ppmV
H_2 - Hydrogen	%V/V
CH_4 - Methane	ppmV
N_2 - Nitrogen	%V/V
O_2 - Oxygen	%V/V

(ppmV = parts per million by volume)
(%V/V = percent volume by volume)

ID 23 = SAMPLE ID 23
<0.123 = INDICATES NOT DETECTED AT THE SPECIFIED DETECTION LIMIT
U J = THE ANALYTE WAS NOT DETECTED. THE REPORTED QUANTIFICATION LIMIT IS APPROXIMATE, AND MAY BE INACCURATE OR IMPRECISE
SORBENT TUBE DATA CORRECTED TO STANDARD CONDITIONS
BOLD DATA INDICATES ANALYTICAL DETECTION

Drafter: M. HOEFER
Project Manager: K.W. SMITH
Task Manager: M. RISHER
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CERCLA LANDFILL FENCE LINE SAMPLING RESULTS

LOCKHEED MARTIN CORPORATION SITE
THE DALLES, OREGON

Project Number: GP000677.2012
Drawing Date: 10/10/12
Figure: 3b

PREDOMINANT WIND DIRECTION

(SEE WIND ROSES FOR DETAIL)

DATE	WIND FROM	WIND TOWARD
9/13/12	ENE (77.5°)	
9/17/12	ENE (77.5°)	
9/18/12	W (270°)	
9/19/12	NNW (337.5°)	
9/20/12	NNW (337.5°)	

Nutrient Shack (ID 12)
9/18/2012 (Sorbent)
NH_3 = < 0.111 mg/m³
HF = < 0.004 mg/m³
HCN = < 0.005 mg/m³
H_2S = < 0.027 mg/m³
PH_3 = < 0.024 mg/m³
9/18/2012 (Summa)
C_2H_2 = < 0.97 ppmV
CO_2 = 440 ppmV
H_2 = < 0.19 %V/V
H_2S = < 13 ug/m3 (UJ)
CH_4 = 2.2 ppmV
N_2 = 78.5 %V/V
O_2 = 21.5 %V/V

Manhole 2 (ID 21)
(10 ft into manhole)
9/19/2012 (Sorbent)
NH_3 = < 0.122 mg/m³
HF = < 0.007 mg/m³
HCN = < 0.004 mg/m³
H_2S = < 0.027 mg/m³
PH_3 = < 0.018 mg/m³
9/19/2012 (Summa)
C_2H_2 = < 0.74 ppmV
CO_2 = 0.496 %V/V
H_2 = < 0.15 %V/V
H_2S = < 10 ug/m3
CH_4 = 1.6 ppmV
N_2 = 80.5 %V/V
O_2 = 19 %V/V

Manhole 2 (ID 25)
(near source)
9/20/2012 (Sorbent)
NH_3 = < 0.122 mg/m³
HF = < 0.004 mg/m³
HCN = < 0.005 mg/m³
H_2S = < 0.029 mg/m³
PH_3 = < 0.019 mg/m³ (UJ)
9/20/2012 (Summa)
C_2H_2 = < 0.75 ppmV
CO_2 = 500 ppmV
H_2 = < 0.15 %V/V
H_2S = < 10 ug/m3
CH_4 = 1.7 ppmV
N_2 = 78.4 %V/V
O_2 = 21.5 %V/V

Manhole 4 (ID 18)
(duplicate)
9/19/2012 (Sorbent)
NH_3 = < 0.112 mg/m³
HF = < 0.004 mg/m³
HCN = < 0.004 mg/m³
H_2S = < 0.026 mg/m³
PH_3 = NM
9/19/2012 (Summa)
C_2H_2 = < 0.74 ppmV
CO_2 = 0.56 %V/V
H_2 = < 0.15 %V/V
H_2S = < 10 ug/m3
CH_4 = 6.2 ppmV
N_2 = 79.3 %V/V
O_2 = 20.1 %V/V

Manhole 4 (ID 17)
(10 ft into manhole)
9/19/2012 (Sorbent)
NH_3 = < 0.122 mg/m³
HF = < 0.004 mg/m³
HCN = < 0.004 mg/m³
H_2S = < 0.023 mg/m³
PH_3 = < 0.020 mg/m³ (UJ)
9/19/2012 (Summa)
C_2H_2 = < 0.75 ppmV
CO_2 = 0.551 %V/V
H_2 = < 0.15 %V/V
H_2S = < 10 ug/m3
CH_4 = 6.3 ppmV
N_2 = 79.3 %V/V
O_2 = 20.2 %V/V

Manhole 1 (ID 20)
(10 ft into manhole)
9/19/2012 (Sorbent)
NH_3 = < 0.112 mg/m³
HF = < 0.004 mg/m³
HCN = < 0.004 mg/m³
H_2S = < 0.029 mg/m³
PH_3 = < 0.02 mg/m³
9/19/2012 (Summa)
C_2H_2 = < 0.74 ppmV
CO_2 = 0.419 %V/V
H_2 = < 0.15 %V/V
H_2S = < 10 ug/m3
CH_4 = 1.2 ppmV
N_2 = 80.5 %V/V
O_2 = 19.1 %V/V

Manhole 3 (ID 24)
(10 ft into manhole)
9/20/2012 (Sorbent)
NH_3 = < 0.112 mg/m³
HF = < 0.005 mg/m³
HCN = < 0.004 mg/m³
H_2S = < 0.042 mg/m³ (J+)
PH_3 = < 0.022 mg/m³ (UJ)
9/20/2012 (Summa)
C_2H_2 = < 0.73 ppmV
CO_2 = 0.23 %V/V
H_2 = < 0.15 %V/V (J)
H_2S = < 10 ug/m3
CH_4 = 420 ppmV
N_2 = 78.5 %V/V
O_2 = 21.3 %V/V

Lift Station 2 (ID 22)
(10 ft into manhole)
9/20/2012 (Sorbent)
NH_3 = < 0.112 mg/m³
HF = < 0.004 mg/m³
HCN = < 0.004 mg/m³
H_2S = < 0.024 mg/m³
PH_3 = < 0.019 mg/m³ (UJ)
9/20/2012 (Summa)
C_2H_2 = < 0.78 ppmV
CO_2 = 0.16 %V/V
H_2 = < 0.16 %V/V
H_2S = < 11 ug/m3
CH_4 = 150 ppmV
N_2 = 78.6 %V/V
O_2 = 21.2 %V/V

Lift Station 1 (ID 23)
(10 ft into manhole)
9/20/2012 (Sorbent)
NH_3 = < 0.132 mg/m³
HF = < 0.005 mg/m³
HCN = < 0.005 mg/m³
H_2S = < 0.029 mg/m³
PH_3 = < 0.021 mg/m³ (UJ)
9/20/2012 (Summa)
C_2H_2 = < 0.76 ppmV
CO_2 = 0.732 %V/V
H_2 = < 0.15 %V/V
H_2S = < 11 ug/m3
CH_4 = 8.4 ppmV
N_2 = 79.7 %V/V
O_2 = 19.5 %V/V

Lift Station 1 (ID 26)
(extraction comparison)
9/20/2012 (Sorbent)
NH_3 = < 0.122 mg/m³
HF = 0.013 mg/m³
HCN = < 0.004 mg/m³
H_2S = < 0.025 mg/m³
PH_3 = < 0.024 mg/m³ (UJ)
9/20/2012 (Summa)
C_2H_2 = < 0.79 ppmV
CO_2 = 0.562 %V/V
H_2 = < 0.16 %V/V
H_2S = < 11 ug/m3
CH_4 = 6.5 ppmV
N_2 = 79.5 %V/V
O_2 = 19.9 %V/V

Lift Station 1 (ID 19)
(near source)
9/19/2012 (Sorbent)
NH_3 = < 0.112 mg/m³
HF = < 0.005 mg/m³
HCN = < 0.005 mg/m³
H_2S = < 0.024 mg/m³
PH_3 = < 0.019 mg/m³
9/19/2012 (Summa)
C_2H_2 = < 1 ppmV
CO_2 = 440 ppmV
H_2 = < 0.21 %V/V
H_2S = < 14 ug/m3
CH_4 = 1.7 ppmV
N_2 = 78.4 %V/V
O_2 = 21.6 %V/V

Sorbent Analytes	Units
NH_3 - Ammonia	mg/m³
HF - Hydrogen Fluoride	mg/m³
HCN - Hydrogen Cyanide	mg/m³
H_2S - Hydrogen Sulfide	mg/m³
PH_3 - Phosphine	mg/m³

(mg/m³ = milligrams / cubic meter)

Summa Analytes	Units
C_2H_2 - Acetylene	ppmV
CO_2 - Carbon Dioxide	ppmV
H_2 - Hydrogen	%V/V
CH_4 - Methane	ppmV
N_2 - Nitrogen	%V/V
O_2 - Oxygen	%V/V

(ppmV = parts per million by volume)
(%V/V = percent volume by volume)

ID 23 = SAMPLE ID 23
<0.123 = INDICATES NOT DETECTED AT THE SPECIFIED DETECTION LIMIT
U J = THE ANALYTE WAS NOT DETECTED. THE REPORTED QUANTIFICATION LIMIT IS APPROXIMATE AND MAY BE INACCURATE OR IMPRECISE.
J = THE RESULT IS AN ESTIMATED QUANTITY. THE ASSOCIATED NUMERICAL VALUE IS THE APPROXIMATE CONCENTRATION OF THE ANALYTE IN THE SAMPLE.
J+ = THE RESULT IS AN ESTIMATED QUANTITY, BUT MAY BE BIASED HIGH
NM = MANHOLE 4 DUPLICATE PHOSPHINE SAMPLE NOT ANALYZED DUE TO BEING LOST INSIDE MANHOLE
SORBENT TUBE DATA CORRECTED TO STANDARD CONDITIONS
BOLD DATA INDICATES ANALYTICAL DETECTION

0 100' 200' 300'
APPROXIMATE SCALE IN FEET
1" = 200'

LEGEND

MH #3 — MANHOLE
LIFT STATION #1 — LIFT STATION
NUTRIENT SHACK AND CERCLA UTILITY BUILDING
3 — FENCE LINE MONITORING LOCATIONS
FENCE LINE SAMPLE LOCATIONS

CERCLA LANDFILL

SOURCE MONITORING LOCATIONS
CERCLA UTILITY BUILDING, MANHOLES, LIFT STATION, NUTRIENT SHACK (9/17/12)
SOURCE SAMPLING LOCATIONS
MH's 1,2 AND 4 (DOWNHOLE) 9/19/12
AMBIENT SAMPLE NEAR LS 1 (9/19/12)
MH #3 AND LS's AND 1, 2 (9/20/12)
LS 1 EXTRACTION COMPARISON SAMPLE (9/20/12)
AMBIENT SAMPLE MH #3 (9/20/12)

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Task Manager: M. RISHER
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CERCLA LANDFILL SOURCE AND NEAR SOURCE SAMPLING RESULTS

LOCKHEED MARTIN CORPORATION SITE
THE DALLES, OREGON

Project Number: GP000677.2012
Drawing Date: 10/10/12
Figure: 3c

Current Plotstyle : ByColor
Layout : Tab1 FIG 3c2
Date\Time : Fri, 26 Oct 2012 — 6:14pm
Path\Name : C:\Montana\LMC\COLOC-0485.dwg
Acad Version : R18.1s (LMS Tech)
User Name : kfrederer